THE DESIGN OF A COST-EFFECTIVENESS ANALYSIS WITHIN A CONCURRENT RANDOMIZED CONTROLLED TRIAL OF THE HAMILTON-WENTWORTH CHRONIC HOME CARE PROGRAMME

By

PATRICIA ANN WALL CAULFIELD Reg.N., B.Sc.N.

A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfilment of the Requirements

for the Degree

Master of Science

McMaster University

August 1979

THE DESIGN OF A COST-EFFECTIVENESS ANALYSIS OF CHRONIC HOME CARE

MASTER OF SCIENCE
(Medical Sciences)

McMASTER UNIVERSITY
Hamilton, Ontario

TITLE: The Design of a Cost-Effectiveness Analysis Within a Concurrent Randomized Clinical Trial of the Hamilton-Wentworth Chronic Home Care Programme.

AUTHOR: Patricia Ann Wall Caulfield, Reg.N. (College of Nurses of Ontario)

B.Sc.N.(University of Western Ontario)

SUPERVISOR: Dr. G.L. Stoddart

NUMBER OF PAGES: xi, 259

ABSTRACT

The economic analysis described in this thesis is designed to compare two alternate approaches to post-hospital treatment for a specified group of chronically ill patients who are aged 65 and over and eligible for Home Care at the point of discharge from acute hospitals. Relative costs and health effects will be compared between the Hamilton-Wentworth Home Care programme and the "no programme" situation or the usual form of treatment without Home Care, using a cost-effectiveness model. Data will be collected from the Home Care group (experimental) and the No Home Care group (control) in a concurrent randomized clinical trial of the Home Care programme for the specified patients of interest. Costs will be measured as described herein. Health effects of interest will be physical function, social function and morale.

The completed results of the study will provide needed information about the magnitude and distribution of costs in each programme alternative for this specific group of patients in Hamilton-Wentworth and about the relation of costs to health effects. The analysis will have relevance to the Hamilton-Wentworth programme and to the Ontario Ministry of Health, as well as planners of similar programmes for similar groups of patients and the patients themselves. The data should add to the growing body of knowledge about the economics of Home Care programmes.

The methods developed here for measuring costs in a variety of services and for collection of health service utilization data could be applied to other studies of similar community-based, multi-service programmes in relation to either specific patient groups or the overall programme impact. The models used for analysis of costs and health effects within the context of a randomized trial should be applicable to other health care evaluations.

ACKNOWLEDGEMENTS

This thesis was completed with the financial support of Health and Welfare Canada, National Health Student Fellowship #606-1556-47.

I am indebted to Greg Stoddart who consistently has given critical feedback with optimism and humour, has set an example of high standards and has patiently led me back through several economic concepts more times than I am sure he cares to count. Peter Tugwell brought the Home Care Evaluation Project to my attention in the early stages. His positive criticism and ability to point out the end of the tunnel just when it disappeared were always appreciated. Gary Anderson has given the thesis close scrutiny. In particular, I am grateful for his comments on data collection strategies and for his generosity with his own time.

I also wish to thank the members of the group responsible for the Home Care Evaluation Project. In particular, Mary Gibbon and Lois Walton were always available and took time to go over programme details and financial data.

This thesis would not have been undertaken without the influence of Dot Pringle, whose committment to research is infectious, and of George Torrance, whose enthusiastic approach to economic evaluation made it seem both feasible and fun. Special thanks are due to Susan Hanna and Flo O'Dowd.

I am grateful to David Caulfield for his calm good humour and for reading more than his share of bed-time stories, and to Sarah Caulfield for her resilience and an understanding far beyond her years.

TABLE OF CONTENTS

	Page
Title Page	i
Descriptive Note	ii
Abstract	iii
Acknowledgements	v
Table of Contents	vi
List of Tables	x
List of Figures	xi
INTRODUCTION	1
CHAPTER 1: HISTORICAL PERSPECTIVES AND REVIEW OF THE LITERATURE	8
The Development of Home Care Programmes	8
Descriptions of Home Care Programmes	19
Classification Scheme	19
The Hamilton-Wentworth Programme	19
Programmes Reported in the Literature	22
Evaluations of the Effectiveness of Home Care	27
CHAPTER 2: ECONOMIC EVALUATION IN HOME CARE	35
Economic Evaluation in the Health Services	35
Models of Economic Evaluation	37
Principles Involved in the Use of Economic Analysis	40
Model, Viewpoints and Cost Definitions for This Study	43
Economic Evaluation in Home Care	45
CHAPTER 3: DESIGN OF THE COST-EFFECTIVENESS STUDY	51
Source of Effectiveness Data -- A Randomized Trial of Chronic Home Care	51
Research Question	52
Sample Specification and Allocation	52
Sample Size and Acquisition Sequence	54
Sequence of the Study	56
Outcome Measurement	56
Description of the Alternative Programmes	57
Viewpoints	61

Categories of Costs and Cost Summaries 63
Cost Equations 67
Summary of Health Effects 70
Research Questions 73
Assumptions 75

CHAPTER 4: COST MEASUREMENT I:
PRINCIPLES, CATEGORIES AND INTRA-PROGRAMME MEASURES 76

General Principles of Cost Measurement 76
Specific Principles of Cost Measurement 81
Categories of Costs in Home Care and No Home Care 87
Measurement of Direct Intra-Programme Costs (Home Care) 92
Nursing Services 92
Homemaking Services 93
Speech Therapy 94
Physiotherapy, Occupational Therapy, Social Work 95
Meals on Wheels 96
Transportation 98
Drugs 99
Equipment 99
Medical Supplies 100
Friendly Visitors 101
Administration and Overhead Costs of the Home Care Programme 102
Measurement of Direct Intra-Programme Costs (No Home Care) 108
Nursing Services 108
Homemaking Services 108
Speech Therapy 109
Physiotherapy 109
Occupational Therapy 110
Social Services 110
Meals on Wheels 111
Transportation 111
Drugs 113
Equipment and Supplies 113
Friendly Visitors 114

CHAPTER 5: COST MEASUREMENT II:
EXTRA-PROGRAMME AND INDIRECT MEASURES 115

Direct Extra-Programme Costs 115
Physician's Services 115
Laboratory and X-ray Services 116
Institutional Service Costs 116

Costs of Nursing Homes, Homes for the Aged and Retirement Homes 117
Hospitalization Costs 117
Illustration of the Step-Down Method 124
Acute, Chronic and Rehabilitation Days 132
Final Allocation of Nursing Unit Costs 134
Costs of Geriatric Day Care 135
Costs of Emergency Room Visits 136
Indirect Costs 136

CHAPTER 6: COLLECTION OF RESOURCE UTILIZATION DATA 138

Methodologic Issues in Data Collection 139
Comparability of Data 144
Specific Strategies 145
Hospital Record Abstraction 146
Physician's Office Records 148
Telephone Interviews 150
Record Review 151
Patient Interview 152
Family Interview 153
Other Data Sources 154
Issues of Reliability and Accuracy 156
Consolidation of Data 158
Summary 158

CHAPTER 7: DATA SUMMARY AND ANALYSIS 160

Data Summary 160
Health Effects Data 160
Cost Data 163
Primary Data Analysis 166
Cost Variation and Comparison 167
Comparison of Costs and Health Effects 169
Implications of Effectiveness Results 173
Secondary Analyses 176
Sensitivity Analyses 177

CHAPTER 8: DISCUSSION AND SUMMARY 179

Interpretation of Analysis 179
Limitations on the Results 182
Ethical Considerations 185
Summary 186

REFERENCES 187

APPENDIX A: BUDGET CONSIDERATIONS 197

APPENDIX B: DETAILS OF THE EFFECTIVENESS STUDY 198

APPENDIX C: METHODOLOGIC CONSIDERATIONS IN THE ECONOMIC EVALUATION OF THE OVERALL IMPACT OF THE HOME CARE PROGRAMME ON THE REGIONAL HEALTH SERVICES 219

APPENDIX D: DESCRIPTION OF HOME CARE: ELIGIBILITY, REFERRAL AND ORGANIZATION 227

APPENDIX E: QUESTIONNAIRES FOR ASSESSMENT OF ELIGIBILITY AND HEALTH OUTCOMES 231

APPENDIX F: HEALTH SERVICE UTILIZATION DATA COLLECTION FORMS 249

LIST OF TABLES

		Page
Table 1.1:	Classification Scheme for Home Care Programmes	20
Table 1.2:	Evaluative Studies of Home Care	28
Table 2.1:	Economic Evaluations of Multi-Service Programmes	47
Table 3.1:	Diagnoses for Inclusion in the Study	53
Table 3.2:	Services Provided by the Home Care Programme	59
Table 3.3:	Availability and Source of Parallel Services for Control Patients	62
Table 3.4:	Symbols Designating Costs	66
Table 3.5:	Cost Designations Across All Categories	67
Table 3.6:	Analysis of Improvement in Functional Outcomes	70
Table 3.7:	Outcome Measurements of Interest for Economic Analysis	71
Table 4.1:	Cost Components - Home Care Group	88
Table 4.2:	Cost Components - No Home Care Group	90
Table 5.1:	Allocation Schedule A Bases for Allocation of Overhead Costs	131
Table 5.2:	Primary and Secondary Comparisons in Classification of Patient Care Days	134
Table 6.1:	Resource Utilization Variables	140
Table 6.2:	Summary of Utilization Data Per Patient	159
Table 7.1:	Illustration of Effect Summary	161
Table 7.2:	Illustration of Compared Effects	162
Table 7.3:	Illustration of Extra Improvement	162
Table 7.4:	Illustration of Summary Cost Statistics - Overall Costs	164
Table 7.5:	Summary Costs for Analysis	165
Table 7.6:	Costs and Health Outcomes by Programme	171
Table 7.7:	Costs Related to Positive Outcomes	171
Table 7.8:	Summary of Cost-Effectiveness Measures	174
Table 7.9:	Outcome Possibilities	175
Table 7.10:	Sensitivity Analyses	178

LIST OF FIGURES

		Page
Figure 3.1:	Sample Acquisition	55
Figure 5.1:	The Process of Step-Down Allocation with Multiple Apportionment	122

INTRODUCTION

> "The economics of health is a curious discipline, somewhat in the tradition of the theology of indulgences which flourished before Luther. You can count what the friars collect, you can look at the temples they build, you can take part in the liturgies they indulge in, but you can only guess what the traffic in remission from purgatory does to the souls after death. Models developed to account for the willingness of taxpayers to foot rising medical bills provide similar scholastic guesswork about the new world-spanning church of medicine."
>
> Ivan Illich [56]

In times of economic constraint, all areas of public spending come under scrutiny. The current climate in the Canadian economy has led to a renewed awareness of the finite nature of the resources available for medical and related services. The resultant concern for controlling expenditures has prompted an increasing interest in the techniques of economic analysis and an emphasis on the development of cost-saving alternative forms of health care.

The problem of allocating scarce resources among competing programmes requires that administrators and policy-makers have

information about the effectiveness and the efficiency of alternative health services. Effectiveness, meaning that a health care manoeuvre or programme does more good than harm to those to whom it is offered, is best measured in randomized controlled trials looking at specific health outcomes [17]. Efficiency, meaning that the implementation of a specific health care manoeuvre or programme maximizes the return for resources invested is best measured using the techniques of economic analysis.

Critics of economic approaches to health care evaluation have argued, in the same vein as Illich, that the results are rendered meaningless when information about effectiveness is absent and must be replaced by estimates. The same argument is applied when health outcomes, often intangible, have to be given a dollar value or when a number of assumptions must be made about various parts of the data base used [121]. At the same time, resource allocation decisions are being made based on the best evidence available. Economic analysis, using the best available effectiveness information and challenging subjective assumptions where necessary, can provide a systematic framework for these decisions. Moreover, there is no reason for not combining effectiveness and efficiency studies in clinical trials, as is the case in the study described here. A concurrent well-designed and randomized clinical trial can remove the "scholastic guesswork" deplored by Illich from the determination of health effects relative to the economic question. While the results of economic studies do not replace other forces brought to bear on allocation decisions, they can provide needed evidence in terms of the efficiency of alternatives.

Community health centres, physician's associates, nurse-practitioners and home care programmes are some examples of recent alternatives developed partially in response to financial restraint and partially in response to therapeutic goals. In some instances, government and other insurers have shifted coverage to encourage both consumers and providers to make less use of the expensive modes of treatment such as acute care hospitals [55,103].

Home care programmes have been advocated as a cost-saving alternative for patients recovering from an acute illness episode (by shortening hospital stay) and for the chronically ill, the elderly and the handicapped (by shortening hospital stay and/or avoiding long-term institutionalization). These programmes are also in response to the generally accepted principle that remaining at home is preferable to admission to an institution for therapeutic or social reasons[64,85]. Women are more interested in having their babies at home and in earlier discharge from obstetrical facilities. Surgical patients are being discharged earlier, both in order to free up surgical beds and to maximize the positive effects of the home environment on recovery. In the particular case of children, efforts are being made to avoid hospitalization, hence decreasing the negative effects of separation from parents. Chronically ill persons of all ages are being maintained at home rather than subjecting them to what can be a very isolating experience.

As Goldmann points out, "Home care was largely ignored in the period in which scientific medicine made great strides,[and] hospitals

became safe"[42]. In contrast to the pre-industrial 'care in the home' provided by family and friends, organized home care in the modern sense means a coordinated and centrally administered programme whereby a number of professional and para-professional services are provided in the patient's home rather than an institution or clinic [57]. Such programmes have been in existence in the United States and some parts of Canada since World War II [15,57,124]. The Ontario programme, financed by the Ministry of Health, has been in existence since 1958 [113].

Initially, the Ontario Home Care Programme was restricted to "active" treatment patients for whom rehabilitation was a reasonable goal, and the patient was expected to be a short-term user of home care services. In October 1975, the programme was extended to include chronically ill patients in three pilot project communities: Kingston, Thunder Bay and Hamilton-Wentworth. In this portion of the programme, patients have need of long-term care in order to maintain function and prevent deterioration. At present, the chronic programme has not been extended throughout the province, although four more communities were added to the pilot project in 1978 and 1979. The Throne Speech in the Legislature in the spring of 1979 promised full extension to all Ontario residents. A preliminary evaluation, using data from 1976, was done by the Ministry of Health and released in 1977 [88]. It was hampered by questionable data accuracy because of the rapid expansion which occurred in 1976. The report recommended further evaluation once case-loads had stabilized. To date, no further evaluation of the overall project has been released.

The cost-effectiveness study described in this thesis is designed to be implemented in conjunction with a concurrent randomized trial of the Hamilton-Wentworth Chronic Home Care Programme for patients aged 65 and over who have specific chronic disease diagnoses and who are entered into the programme at the point of discharge from acute care hospital. Health effects in terms of physical function, social function and morale will be measured in both the experimental group, who receive the Home Care programme, and the control group, who do not receive the Home Care programme. Cost related data such as utilization of health care resources outside the programme itself will be collected at the same time. The costs and health effects measured after one year of follow-up will be compared to analyse the differences between the alternatives of Home Care and the status quo or No Home Care, for the particular group in question. The objective of the economic analysis will be to answer the question:

> What are the relative costs and health effects (in terms of physical function, social function and morale) of the Hamilton-Wentworth Home Care Programme for patients aged 65 and over, who are eligible for Home Care, have specified chronic disease diagnoses, and are at the point of discharge from hospital, as compared to the "no programme" situation for patients of the same age and diagnoses who are eligible for but not admitted to the Home Care Programme at discharge from hospital?

Since, in 1978, 72% of the patients in the Hamilton-Wentworth Chronic Home Care Programme were aged 65 and over, and 60% were admitted to the programme from hospital at discharge, it was decided that this was the most appropriate group for the focus of the effectiveness trial. Inclusion of a larger number of patient categories either in terms of age or diagnosis or point of entry into the programme would increase the study's complexity and put its feasibility in jeopardy.

Since the Hamilton-Wentworth Home Care Programme has now been stabilized it is appropriate to undertake an evaluation of its effects on patient outcomes and costs to various constituencies(the Ministry of Health or the patient and his family, for example). Although several studies in the literature have addressed the issue of the economics of home care, no systematic analysis of a programme of the type in Hamilton-Wentworth has been done. The opportunity to include an economic analysis with a concurrent randomized trial provides access to first-hand effectiveness measures. It is relevant and timely that such a study be done when one of the arguments used to "sell" home care is that it will save health care dollars and when the programme is stabilized but not yet implemented on a large-scale, province-wide basis. At least for patients of the type specified for the randomized trial, the study should provide a reasonable estimate of the relationship between costs and health effects.

Chapter 1 describes the literature to date on home care programmes in general, including the types of programmes that exist, their funding, the arguments for home care and the evidence in relation to

the effectiveness of the various programmes. The programmes described in the literature will be contrasted to the one in Hamilton-Wentworth. Chapter 2 describes the role of economic evaluation in health care planning and models for economic analysis as well as those studies of home care designed specifically to answer economic questions.

The design of the cost-effectiveness study for the Hamilton-Wentworth programme is outlined in Chapter 3, including a brief description of the concurrent effectiveness study. Strategies for cost measurement described in Chapter 4 include those for costs of the programme services and for similar services in the control group. In Chapter 5, the strategies for measuring costs of health services outside those of the programme or the programme-equivalents in the control group will be described. The alternative approaches to data collection for community service and health service utilization will be outlined in Chapter 6. Chapter 7 summarizes the approach to the analysis of cost data in relation to health effects. Chapter 8 discusses the limitations on the interpretation of the results.

Budget requirements for the implementation of the study are outlined in Appendix A. In Appendix B, the effectiveness study is described in detail. Appendix C points out some of the issues of methodology that would have to be addressed in an attempt to evaluate the overall impact of the home care programme on health services in the region. Appendix D contains descriptive material about the Hamilton-Wentworth Home Care Programme. Appendices E and F contain data collection instruments for health effects and health service utilization data respectively.

CHAPTER 1

HOME CARE: HISTORICAL PERSPECTIVES AND REVIEW OF THE LITERATURE

In this chapter, the development of home care programmes will be outlined, along with the social and economic climate in which they have arisen. The patterns of care of interest in this study will be described. A classification of home care programmes will be developed according to stated goals, target population, type and extent of services provided, methods of financing and the location of the administrative responsibility. The literature on home care will be reviewed and evaluative studies will be classified according to methodology. Results of the evaluation studies will be summarized. The development of home care in Ontario and Hamilton-Wentworth will be described and compared to other jurisdictions.

The Development of Home Care Programmes

Prior to the rise of modern medicine and sophisticated health care technologies, it was usual for the ill and disabled to be tended and maintained at home by family and friends. Hospitals were places for the destitute and dying and were to be avoided if at all possible. The modern home care programme is not designed to return to self-care or family-care, but rather attempts to take the professional and

para-professional services available in institutions to the patient at home. Patients who do not use all of the technological and specialized care in the hospital, but are there because they are not ready to return to complete independence can benefit from this type of service. Patients who are not in hospital, but are having difficulty functioning independently at home can also benefit. Home care programmes have been described in the following way by the Public Health Service of the United States Department of Health, Education and Welfare:

> " ' A coordinated home care program is one that is centrally administered, and that through coordinated planning, evaluation and follow-up procedures provides for physician-directed medical, nursing, social and related services to selected patients at home.' "
>
> [57]

In the United States, such programmes date back to 1796 when a nursing service for the homebound indigent sick was established by the Boston Dispensary [114]. The first modern programme, however, is generally considered to be the one at the Montefiore Hospital in New York City established in 1946 [5,15]. Since that time, home care programmes have proliferated in varying degrees of comprehensiveness. Many are based in and administered by hospitals and funding varies from public to private agencies.

In Canada, home care programmes are varied in terms of "approach, organization, scale, payment and problems" according to M. Wills in his 1972 review [124]. The province of British Columbia has had home care

programmes, although not fully subsidized, for over 50 years[20]. Ontario initiated home care programmes for "active" short-term patients in 1958 on a pilot basis and the full programme was begun in 1966. There are now 38 programmes throughout the province. The Chronic Home Care Pilot Project was begun in 1975. Saskatoon has had a publicly financed and hospital administered programme since 1959 that has been successful in meeting its goals of rehabilitation and long-term maintenance in the home [54].

As in the United States, various forms of home care have developed throughout Canada. In Ontario, "active" home care for rehabilitation over a short-term is publicly funded and administered by different agencies in different communities. For example, the Hamilton-Wentworth programme is one of several run by the Victorian Order of Nurses and its Board of Directors, while in Toronto, the Home Care Programme has its own Board. At present, the Chronic Home Care Programme, similarly financed, is available only in a limited number of pilot study communities.

The movement toward home care can be linked with two particular side effects of the health care explosion of the twentieth century. The first is the discovery that institutionalization, either in acute care hospitals or long-term care facilities, can have negative effects on the results of medical treatments and on social and emotional functioning. The second is the fact that health care planners are under increasing pressure to contain costs and develop alternative forms of service which will make better use of the health care dollar.

Home care programmes have been 'sold' on the basis that they will save money, particularly when compared directly to hospitalization. This is dependent on what the economic goals of the programme are and what else happens in the health care system, as will be discussed later in this thesis (Appendix C).

The generally accepted concept that care in the home is preferable to hospital care has its basis in studies of the sick role, the effects of institutions on recovery, the development of interest in terminal care and long-term treatment of the chronically ill and the rise of consumerism in the health field.

As the complexity of modern health care has increased and we have come to rely on more specialized skills and technologies, the centralization of these services into the present-day hospital has developed as a logical corollary. In addition, the great strides in health care which came about as a result of the growth in hygienic practices since the nineteenth century [35] have enhanced the role of the hospital as a place where standards can be monitored and maintained. John Knowles has summarized the place of the hospital in our society:

> "The hospital has evolved from a House of Despair avoided by all but the impoverished sick to a House of Hope to which all roads lead in time of crisis -- be it somatic, psychic or social in origin."
>
> [62]

Concurrent with the new dependency on hospitals and high technology, modern North American life-styles are characterized by a move to more placement of the elderly, infirm and dying in institutions of all kinds ... nursing homes, chronic hospitals and homes for the aged [2]. The decline of the extended family often results in few familial resources available to our elderly citizens.

In Canada, from 1958 to 1968, further incentives to hospitalization existed when universal public hospital insurance existed, but similar medical insurance did not. Evans [29], Leclair [66] and Soderstrom [103] also point out the disincentive to keep people at home because of insurance coverage for institutionalization only. Schwenger [98] notes that in spite of a smaller percentage of the population over the age of 65 than in Britain or Western Europe, Canada has a higher percentage in institutions. The Science Council of Canada [99], referring to this phenomenon, stated: "Undoubtedly ... one of the main factors is that in Canada home care services were not insured simultaneously with hospital and institutional care ... As a result, continuous pressure has existed for years in this country to place far too many sick and older people in institutions."

Counter to this reliance on institutions is a growing concern for the unwanted effects of hospitalization that arise because of removal from familiar surroundings, impersonal approaches and the dependency fostered by long-term institutionalization. Goffman's work on the effect of total institutions and Parson's work on the sick role were central to focusing on the negative aspects of hospitals [41, 91].

Several investigators using analytic survey techniques have found institutionalization of the aged to be associated with heightened morbidity, high rates of mortality, and gross psychological disability [1,67,94,96]. In the case of long-term institutionalization, it has been shown that dependency and limited control over one's daily activities can decrease motivation, productivity and personal satisfaction [114]. Several authors advocate care in the home, particularly for the chronically ill, the elderly and the terminally ill [24,75,81,96,104]. Central to the argument for care in the home is the idea that maintenance of a normal and familiar setting can enhance satisfaction and motivation to function at the highest level possible.

Along with increasing awareness of positive therapeutic effects from keeping people at home, there is a growing consumer movement in health care. Trager points out that "In recent years, there has been a growing emphasis on the therapeutic importance or preservation of personal life-styles, of the protection of the individual identity, and of the patient's rights -- more simply defined as the restoration of normal rights and privileges to persons who happen to be ill" [116]. Many patients prefer to stay at home for as long as possible or to go home sooner from hospital. The women's movement in North America has brought about a new awareness of delivery in the home (this is a usual practice in Europe and Britain).

Although medical and health care services abound, they are not evenly distributed throughout the province and in some areas admission

to hospital means not only removal from one's home, but also may mean removal several miles away from one's community. Home care programmes can bring professional services to the patient. It has been reported by Brickner and his colleagues in New York City [6] and Gibbon in Hamilton [39] that even in these cities, the elderly are homebound to the extent that they might as well live in an isolated community in terms of their access to health care facilities. These people are in need of some services either in the home or in clinics but are either physically or financially unable to get to available services. One problem with elderly and disabled people remaining at home instead of in institutions is that the care they require can often be of real physical and financial hardship on families who tend to them. Writing about domiciliary care models in Britain, Cang points out that such programmes can protect "relatives from unreasonable strain, since home care is not at the cost of the relatives being worn out, or having to give up work or other activities" [11].

The economic case for home care assumes that the programme is at least as effective in achieving health outcomes as the alternative of the usual form of ambulatory and/or institutional care in the community. The argument is that home care programmes will cost less in dollars either through early discharge of patients from hospital or avoidance of admissions to hospital or other residential institutions. Although there are several problems in the methodology of equating one home care day to one saved institutional day (see Appendix C), the argument is supported by reports of over-use of institutional resources by the over-65 age group [98].

In spite of the fact that national health expenditures in Canada have been increasing in absolute terms since 1960, this is not reflected in trends in health spending when expressed as a percentage of the gross national product. In fact, that percentage has been decreasing slightly since 1970 [50]. This is in contrast to the United States where total expenditures have been increasing less rapidly but the proportion of the gross national product which health spending represents has been increasing steadily [48]. In 1975, Canada spent some $11.3 billion on health or 6.9% of the gross national product [49,50]. The portion spent for personal health care was $10.2 billion or 6.1% of the gross national product. Institutional care accounted for $6.2 billion or 3.8% of the gross national product. Thus, 89% of all health care expenditures were for personal health care, and 61% of those (55% of the total) were for institutional care. Preliminary data for 1976 [51] indicate little change in these proportions. In that year, some $13.6 billion were spent on health, with 88% or $11.9 billion spent on personal health care and 54% of the total or $7.2 billion spent on institutional care.

In 1976, R.D. Fraser and his associates, working for the Ontario Council of Health, published a monograph in which they estimated the direct and indirect economic burden of ill health in Ontario for 1971, by diagnostic category [32]. The direct burden estimates attempt to measure the expenditures for the prevention and treatment of disease, excluding certain costs such as education, research and non-prescription drugs. The major components included were hospital care, physician and dental care and drugs. It was estimated that the total direct

burden for 1971 (that is, the cost of delivery of services) was $2,002.9 million and that the hospital portion of that was some $1,142.7 million. The indirect burden estimates attempt to measure productivity lost due to morbidity and mortality, in this case using hospital morbidity only. Overall, the indirect burden of ill health for 1971 was estimated at $973.8 million.

Since it is clear that hospital costs account for a large percentage of overall health costs, home care as an alternative is attractive. The argument is based on the assumption that either the length of stay can be reduced or that admission to a long-term care facility can be avoided. Although there are methodologic problems in using per diem rates for analysis in that they often do not reflect resources used up (see Appendix C and Chapter 5), these are often used in the literature to illustrate home care programmes as cost-saving. For example, Walton and McNairn [119] compare the daily rate of $7.63 for the Hamilton-Wentworth Home Care Programme in 1976 to $66.90 for a Chronic Care bed, $122.10 for a Rehabilitation bed and $15.00 for the Ontario Health Insurance Plan (O.H.I.P.) portion of the daily rate for an Extended Care bed in a nursing home.

The organized home care programme in Ontario is financed publicly and therefore the financial burden to the patient and/or his family is much relieved if there is a programme in place. Most of the services coordinated through the Home Care programme can be purchased privately by the patient. With one exception, these are not insured under O.H.I.P. and the patient must pay a fee-for-service

unless he has a private extended medical insurance plan. The exception is when the patient attends an out-patient clinic for physiotherapy or speech therapy. In this case, the cost of the service is covered by O.H.I.P. through the funding mechanism for the clinic.

From the viewpoint of the patient and his family, the Home Care programme can be a cost-saving one if the services publicly financed through the programme are purchased without it. Some 'services' such as drugs are purchased by the non-Home Care patient, but it is most likely that the majority of services are not, even though they are available. There may be costs associated with an increased amount of time donated to the patient by all family members, but again this will not be so in every case. Moreover, Home Care may increase patient costs. If, without the programme, the patient would have permanently given up his home and entered an institution, then his room and board costs are an added expense with home care. With the newly announced chronic care fee for institutionalized patients [53] this would be true for 60 days. After that time, patients would pay a chronic care fee per day to cover room and board costs. This may or may not equal the room and board costs of Home Care patients.

The issue of the effect of Home Care on the financial burden to the Ministry of Health is more complex. If a home care programme is mounted with no other changes in the system (that is, no alteration in the hospital bed stock or hospital utilization patterns) then the programme is 'added on' to existing expenditures and one would expect an increase in the government financial burden. One might also

expect an increase in health levels in the population, given that all existing programmes and the home care programme are effective. In other words, the increased input of the home care services might be expected to increase the output of health. If this were true, it might justify the extra expense, but cannot be construed as evidence that home care saves dollars.

The argument used to 'sell' home care by comparing daily rates between institutions and the programme assumes that one home care day equals one hospital day saved. A counter-argument is that this will only be true if hospital beds are closed. However, beds are often "closed" by shutting down a ward and not staffing it. In this instance there are still expenditures associated with the facility in the form of maintenance and capital depreciation. The only way we can say that the daily expenses associated with "closed" beds are saved is if the beds are completely eliminated as contributors to the total expenses of the institution. If, as a result of the home care programme, expenditures are decreased by an amount greater than those incurred by home care, either by eliminating beds or some other programme, then the home care programme can be said to save dollars from a government point of view.

Descriptions of Home Care Programmes

In this section, home care programmes will be classified according to a number of service and administrative characteristics. The Hamilton-Wentworth programme will be described in relation to the comparison of interest in this study, and in order to contrast other programmes from the literature. The variety of home care programmes in the United States and Canada will be reviewed.

Classification Scheme

The literature contains many articles on care in the home. The form and goals of programmes vary widely, and it is helpful to place the various types in some sort of classification scheme. This scheme is outlined in Table 1.1. As can be seen, programmes may differ in terms of their overall goals, both therapeutic and economic, their funding, the services provided and their administrative organization. Evaluative studies are classified later in this chapter.

The Hamilton-Wentworth Programme

In terms of the services provided, the Hamilton-Wentworth Home Care Programme is comprehensive in scope, coordinating a number of professional and para-professional services for its patients. These include visiting nursing, physiotherapy, speech therapy, occupational therapy, visiting homemaking, social service, meals-on-wheels, sick-room equipment and some others. A few of these services are provided

Table 1.1: Classification Scheme for Home Care Programmes

Category	Types	Reference Examples
A. Purpose	*1. Reduce Hospital Stay	22,26,36,38,55,57,70,77
	*2. Maintain Function/Avoid Institution	6,15,22,55,71,75,114
	*3. Reduce Costs (Compared to Institution)	7,18,22,36,55,80,90,122
	4. Maintain Family	7,16,27,109
B. Scope	*1. Comprehensive	15,20,22,40,55,71,92
	2. Single Service	27,58,52,59,111
C. Services Provided	*1. Acute Care	26,36,38,57,77,101
	*2. Chronic Care	4,6,15,22,40,55,71,76
	3. Diagnosis/Type of Diagnosis Specific	21,27,31,58,72
	4. Age Specific	7,27,111
D. Funding	*1. Public Health Care Plan	20,36,63,92
	2. Private Health Care Plan	55
	3. Private Sector	6,18
E. Administration	1. Hospital	4,15,16,57,70,114
	*2. Community Agency	6,22,63,92,119

* Indicates classification of the Hamilton-Wentworth programme

directly by staff of the Home Care programme, such as social service and occupational therapy. However, most of the services provided are purchased from existing agencies in the community and coordinated by the programme. The patients in the programme require acute or chronic care with the various goals of reducing hospital stay; maintaining function and preventing deterioration in order to avoid institutionalization; and reducing health care costs. The programme serves patients in any age group. In this study, the programme of interest is the one designed for chronic patients in order to maintain function and prevent deterioration and the age group of interest is the 65-and-over group. Patients in the chronic portion of the programme have access to the same group of services as the active patients, but some services (such as visiting homemaking) are not as restricted in terms of number of hours allowed. Although there is no restriction on length of stay on Home Care in either portion of the programme, it is generally the case that active patients stay for a shorter period based on their goals of return to complete independence as opposed to maintenance of function in the chronic programme.

The programme is publicly financed through the Ontario Ministry of Health Personal Care Division. Although the programme requires a physician's referral for admission, the physician's fee is not funded by the programme itself, but rather through the Ontario Health Insurance Plan. In Hamilton-Wentworth, the programme is administered by the Victorian Order of Nurses of Canada, Hamilton-Dundas Branch.

The cost-effectiveness study described in this thesis is concerned with the comparison of the Home Care programme for patients who are aged 65 and chronically ill to the usual pattern of care in the community (without Home Care). Patients eligible for Home Care at the point of discharge from hospital will be assigned to either 'Home Care' or ' No Home Care', and the costs associated with each alternative and the relative health effects will be measured. Hence, the comparison of interest in this study is between two alternative forms of patient management in the community. This is in contrast to many studies reported in the literature, which compare home care to some form of full or partial hospitalization.

The Ontario Home Care Programme began as a pilot project in Toronto in 1958, and now exists in 38 communities throughout the province for 'active' or short-term care [85]. The pilot chronic care project was begun in October 1975 in Hamilton, Thunder Bay and Kingston, and was expanded to four more communities in 1978 and 1979. It is still considered a pilot project, and the Ministry of Health is undertaking an overall evaluation. The programmes are generally administered locally by an already existing agency and are publicly funded. In Toronto, the Home Care programme has an independent Board of Directors.

Programmes Reported in the Literature

Programmes of primary interest to this study are comprehensive in scope, provide chronic care, are designed to maintain function and

reduce costs, are publicly funded and are administered by a community agency. However, few programmes described in the literature are exactly like this. The descriptive literature will be reviewed with these classifications in mind.

Comprehensive programmes are described by a number of authors. In British Columbia, "hospital-replacement-day" projects have been in place in a number of communities since the beginning of this decade. They are fully subsidized and administered by the government, and provide a variety of services to acute, chronic, maternity and pediatric patients. Crane [20] points out that hospital staffing patterns have altered since the beginning of the projects to accomodate a sicker hospital population. Manitoba has a fully comprehensive programme for both acute and chronic patients, government financed and administered [45]. Rioux [92] describes the Edmonton programme which emphasizes social service as well as health care and coordinates services from existing agencies such as the Victorian Order of Nurses, much like the Hamilton-Wentworth programme.

In the United States, some comprehensive programmes include physician services with home visiting. For example, the Montefiore Hospital programme in New York City provided this service along with several others using the staff of the programme [15]. Although this was a comprehensive programme including several types of patients, its emphasis was on the chronically ill. The programme has moved away from the home care focus into out-patient work with special transport for patients to the clinic [93] as a result of changing styles of

physician practice and the hazards of home visiting in the 'concrete jungle'. Other hospital-based programmes are at the Massachusetts General Hospital [114] and the Beth Israel Hospital [57] in Boston. Hurtado and his colleagues at the Kaiser-Permanente Health Plan [55] in Oregon describe a hospital-administered home care programme designed to ease the pressure on both acute and extended-care beds One aspect of the study was to train and use home health aides instead of more expensive professionals. This aspect of the programme is described as particularly successful. Hurtado also closely monitored costs to the insurance plan of each of the alternative forms of care, and this aspect is discussed in more detail in Chapter 2.

In Canada, Lewis and Mackey [70] have reported on a programme for elderly and post-operative patients, provincially funded and operated out of the Central Newfoundland Hospital. In Winnipeg, there has been a home care programme in operation since 1958 at the Winnipeg General Hospital for chronically ill patients [16]. In Wellington County in Ontario, a special project, administered by the Victorian Order of Nurses provided short-term home care for a variety of acute patients and longer-term care for chronically ill patients from 1965 to 1967 with special National Health and Welfare funding [22]. This programme has since been extended to cover Dufferin County and the City of Guelph, and is funded through the usual provincial route as are other home care programmes in the province.

Some programmes are designed only for the acute or short-term patient. The study reported by Gerson [36] in Newfoundland to evaluate

the economics of home care, and discussed in more detail in Chapter 2, was designed to reduce hospital stay for a number of specified acute medical and surgical conditions. The reasoning in a programme like this is two-fold: first, that the patient will recover faster and more satisfactorily in his own home and second, that the early discharge of such patients should reduce costs or increase the availability of beds. Other active programmes are described by Shah [101] who studied early discharge post-operatively for children, Echeverri [26] who looked at post-operative home care in Colombia for adults with non-major surgery, and Mather [77] who studied the effects of home care for myocardial infarction when compared with hospital treatment.

Chronic home care programmes, especially for the elderly, are commonly described and many authors see this patient group as being the one most likely to benefit from home care. Several programmes already mentioned include chronic care for the elderly, including the ones described by Hurtado [55], Crane [20], Rioux [92], Cherkasky [15], Lewis and Mackey [70] and Tolkoff-Rubin and colleagues [114]. Brickner describes a programme in the Chelsea Village area of New York City that is jointly administered by hospital and community officials [6]. Roth describes a hospital-based programme for chronic patients [95]. Similar programmes, designed to maintain function and prevent deterioration are found in various parts of the world, for example, in the Netherlands and Scandinavia [76], in Israel [71] and in South Africa [40]. Several studies have examined domiciliary care in the United Kingdom and are discussed in the evaluation section of this chapter and in Chapter 2.

In countries where there is universal medicare, these services are usually covered in some way by the scheme. In the United States, funding varies from government insurance (where applicable), to private insurance schemes such as that described by Hurtado [55], to programmes where patients pay a fee for service.

Many programmes are designed to provide a single service or care for patients with a single type of disease. Examples of this type of programme are services for home maternity care [27,72], respiratory care [34], paraplegia [109], hemophilia [111] and psychiatric care [31] to name a few. These programmes will not be reviewed in detail here since they are not comparable to the one in Hamilton-Wentworth in this study. They are often funded by foundations for the particular disease and many have been in operation for years.

The Working Group on Home Care Programs (Health and Welfare Canada) has overviewed the field and strongly recommends the inclusion of home care as a universal benefit under medicare [45]. This recommendation is supported by the Ontario Council of Health Task Force on Health Care for the Aged in its report published in 1978. The Task Force recommended that the Ministry of Health "expand Home Care Programs to provide better total care in the elderly persons' own homes ... on the assumption that further evaluation of the pilot projects offering home care to chronic patients ... supports the expansion of Chronic Home Care." [85] Home care programmes have also been supported by the Federal Working Group on Health Services for the Elderly. [47]

Among articles in the literature that advocate home care in general, Griffith [43] has advocated the treatment of the aged cardiac patient at home. Somers and Bryant [104] deplore the neglect that has been a long-standing problem in this area of health service. Markson surveyed community services for the elderly in 1973, and recommended expansion of home care services [75]. Donabedian and Rosenfeld [24] followed 82 patients from discharge with heart disease, rheumatoid arthritis or diabetes for 60 days, concluding that a home care programme would have been valuable for this group. After 60 days, 48% were institutionalized and only 5% had not made any demand on 'caretaker' services in the community.

Evaluations of the Effectiveness of Home Care

By far the most common forms of review of home care reported in the literature are surveys and descriptive studies. In summarizing the results, many authors make advocacy statements about the positive value of home care and its potential as a cost-saving alternative form of health care delivery. Several studies discussed in the previous section can be classified in this way. [6,22,71,92,114]

Excluding the descriptive literature already reviewed, studies that attempt to evaluate home care programmes are classified in terms of methodology used in Table 1.2. Included in the table are the types of outcomes of interest to the investigators, namely: morbidity, mortality, functional health outcomes and patterns of health service utilization.

Table 1.2: Evaluative Studies of Home Care

Studies by Design Category		(Ref.)	Outcomes: Morbidity	Mortality	Health Service Use	Functional Status	ACTIVE or CHRONIC
A. Analytic Surveys							
1. Cherniak, R.M.	1969	(16)		x	x		C
2. Hunt, T.E. & Crichton, R.D.	1977	(54)			x	x	AC
3. Hurtado, A.V. et al.	1972	(55)			x		AC
4. Krause, A.S. & Armstrong, M.I.	1977	(63)			x	x	C
5. Wartski, S.A. & Green, D.S.	1971	(120)			x	x	AC
B. Cohort Analytic Studies							
1. Bryant, N.H. et al.	1974	(7)	x	x	x		C
2. Epstein, L.M. et al.	1973	(28)			x	x	AC
3. Mitchell, J.B.	1978	(79)				x	C
C. Randomized Controlled Trials							
1. Gerson, L.W. & Hughes, O.P.	1976	(36)			x	x	A
2. Gersten, J.W. et al.	1968	(38)				x	A
3. Hill, J.D. et al.	1978	(52)	x	x	x		A
4. Katz, S. et al.	1972	(59)			x	x	C
5. Nielsen, M. et al.	1972	(82)		x	x	x	C

In studies of the analytic survey type, the aim of the work is generally to analyze the status of a group of patients on home care in terms of health service utilization and functional status. In some studies, the rates of expenditure for the home care service components (for example, costs to the programme of a nursing visit) are measured and compared to the daily rate or total rate per case of hospitalization. No attempt is made to measure costs other than those of the service components of the home care programme. For example, Cherniak [16] estimated the costs of the programme per patient years (based on service costs) and compared this to the cost per day of hospitalization as defined in the per diem rate. Most authors include some similar form of crude measure of costs of patient service in comparison to institutional costs.

Cherniak analyzed outcomes in relation to re-admission to hospital and mortality among chronic respiratory patients over a ten year period in the home care programme of the Winnipeg General Hospital. Some 55% of the patients were re-hospitalized and 47% died after an average of 361 days on the programme. He and his colleagues concluded that this was inevitable due to the nature of the condition regardless of where the patient is treated and that the home treatment programme has beneficial effects in terms of family relationships and contentment. These outcomes, however, were not measured in the study patients. Hunt and Crichton [54] studied the records of the Saskatoon Home Care Programme over 16 years in some detail. This programme is administered by the University Hospital of the University of Saskatchewan and is

very similar to the Hamilton-Wentworth programme in terms of the services provided, the patients cared for and the criteria for admission. They anecdotally describe the types of services and problems that occur with patients such as spinal cord injured people, terminally ill people and stroke patients. They concluded that the programme was able to maintain function and that only the severely disabled were admitted to hospital.

Hurtado [55] in the home care programme of the Kaiser-Permanente Health Plan in Oregon found that home care was an important added service to the other alternatives of acute or extended-care hospital, and that patients often passed through all services in the course of an illness episode. Home Health Aides were successfully trained and supervised to carry out several functions previously done by more costly professionals. Krause and Armstrong [63] longitudinally compared (by record review) 218 patients in the Kingston, Ontario pilot Chronic Home Care project to staff predictions of their prognosis and rate of re-admission to hospital. They found that the Home Care programme delays admission to hospital and produces foreseeable stability in the patient's condition. Wartski and Green [120] randomly selected 67 patients in the Nassau County New York Home Care programme in a sample stratified by length of time in the programme. The Barthel Index of physical function was used with these patients to compare functional outcomes with some characteristics of the patients' experiences with home care. The study supported the use of functional indices in evaluating home care programmes, particularly if before and after

measures can be taken. The study did not demonstrate any correlation between functional capacity and amount of service used, such as number of visits or length of stay on home care.

While these analytic surveys indicate that home care may be a worthwhile service in terms of meeting its stated therapeutic goals, they cannot demonstrate effectiveness because of limitations in the design. Without a control group who do not receive home care, there is no way of knowing whether or not these outcomes would have come about anyway regardless of the programme. In addition, several of the studies use subjective clinical judgement, either from surveys of the opinions of staff or from record review, rather than independent assessments or objective measures taken on the patients themselves. Hence, the comparability of the functional outcome data is in question.

Cohort analytic studies attempt to correct some of the problems of methodology inherent in analytic surveys by following two or more groups of patients, some of whom do not receive home care, over time and measuring outcomes directly. Control groups are usually matched to the home care groups on a variety of characteristics such as age distribution, diagnoses and the like.

Bryant and her colleagues at the St. Luke's Hospital Medical Centre in New York City [7] studied two matched groups of stroke patients who either did or did not receive home care. They found fewer recurrences of stroke, fewer deaths and shorter hospital stays in the home care group. Both groups were followed from admission to hospital with stroke through nine months. Mitchell [79] reports a

comparison of three alternatives for long-term care in the United States Veteran's Administration Health Service. Using a non-equivalent control group design and multiple regression analysis, they found that the home care patients had the greatest mean improvement in functional health status, but that patients with good or guarded prognoses showed the greatest mean improvement over all programmes. Functional outcomes were measured with a Functional Status Index administered by independent social workers at entry into the study and at 3 months follow-up or at exit from the programme, whichever came first. Epstein [28] compared home care patients in one area of Jerusalem with patients not receiving home care in an adjacent area of the city and found that there were no significant differences between the groups in terms of re-hospitalization or functional capacity as defined by the attending physicians. The home care patients were more compliant with medical instructions however.

A system of random assignment of patients to the experimental or control manoeuvre in randomized trials eliminates the problems of possible systematic differences between the two groups which can occur in cohort analytic studies. The results of a well-designed randomized trial can answer questions about effectiveness with a reasonable degree of accuracy. Of the six randomized studies reviewed here, none closely approximates the one proposed for the Hamilton-Wentworth programme in terms of the specific patient population or the scope of the programme and services provided.

Gerson and Hughes [36], in a study of a hospital-administered

home care programme for short-term primarily post-surgery patients, found no difference in all but 5 of 13 surgical conditions in the length of time before return to usual activities between home care and hospital-treated patients. Gerson acknowledges difficulties with the implementation of the study because of the fact that the programme was new and many patients randomly assigned to home care were not placed in the home any earlier than hospital patients. The economic aspects of this study are discussed in Chapter 2. The programme differed from the one of interest here both in terms of administration and target-group. Gersten and his colleagues [38] studied the results of physical rehabilitation services offered in the home or in a hospital clinic in Denver, Colorado. The results from this randomized study indicated that the home situation had certain advantages (such as less transportation inconvenience and easier identification of problems) but that neither was superior in terms of a variety of detailed functional outcome measures. This group and programme differ from the Hamilton-Wentworth situation, in that it is not comprehensive but service-specific.

J.D. Hill and his colleagues [52] randomly allocated emergency calls about possible myocardial infarction to home care or hospital care. In the home care group, a hospital-based team assessed and treated patients in the home in response to a call from the family physician. They concluded that hospital admission provided no clear advantage for these patients. This short-term acute care programme differs markedly from the one described in this thesis. In a programme more closely resembling the one in Hamilton-Wentworth,

Katz [59] randomly assigned patients discharged from the Benjamin Rose Hospital (a chronic rehabilitation institution) in Cleveland to visiting nursing or control groups. There were 300 patients in all, and the manoeuvre tested was the single service of visiting nursing. Results indicated that, for certain sub-groups of the sample, the nursing programme generated use of other services. Also, there was a decrease in functional deterioration in the experimental group. In another study in the same city and out of the same hospital, Nielsen [82] studied survival, contentment and institutionalization between groups of patients who either did or did not receive an experimental home aide service. By design, nursing and social services were not available to either group. Outcomes were measured at one year by structured interview. The results demonstrated that the treatment group had (a) fewer admissions to long-term institutions, (b) some increase in 'contentment' scores and (c) no difference in death rates.

In summary, the review of the evaluative literature reveals a few studies of programmes that indicate some favourable outcomes with home care. However, none of these programmes match the one in Hamilton-Wentworth in terms of organization and services provided or in terms of the patients served. The only comparison of two community alternatives (versus the comparison of community and hospital care) is the one done by Katz. That study looked only at one service and the results are confusing. None of these studies included a detailed and systematic economic analysis.

CHAPTER 2

ECONOMIC EVALUATION IN HOME CARE

This chapter will overview the principles central to economic evaluation and models for economic analysis, with particular reference to the health service field. Studies reported in the literature whose specific goal was the economic evaluation of home care will be reviewed. The rationale for the choice of a cost-effectiveness model will be discussed and the choice of viewpoints and definition of cost categories will be outlined.

Economic Evaluation in the Health Services

The current pressures of shrinking budgets and rising expectations have already been mentioned earlier in this thesis. It is most likely that the new interest in economists (on the part of health care workers) and in health (on the part of economists) is not merely a matter of chemistry, but founded on a mutual awareness of the need for both sound policy and efficient health care programmes. One debate that continues is related to whether or not it is valid to evaluate the efficiency of a programme before the effectiveness of it is known. Klarman points out that "such an exercise is not only idle, in that it can make no contribution to policy formation, but it may be counter-

productive if it obscures the fact that the relationships between inputs and outputs are not yet known and remain to be ascertained."[61]

It is true that economic evaluation does not address the question of whether or not a particular health care manoeuvre produces certain health outcomes (that is, the relationship between technical inputs and outputs). Indeed, the effectiveness of the manoeuvre is assumed in the course of an economic evaluation, which is primarily concerned with the relation between resource inputs and outputs. On the other hand, few health care manoeuvres or programmes have been evaluated scientifically to give reasonable estimates of their effectiveness, and most programmes are advocated on the basis of educated speculation or anecdotal reports as to their results.

It remains that health policy-makers decide daily as to the fate of a variety of programmes, and this is becoming more apparent since health care moved into the public sector as a result of the introduction of universal medicare. As Weinstein and Stason [121] point out, the need to make decisions suggests that we do the economic analyses on the best available evidence to make resource allocation decisions and that designs allow for incorporation of new data when it becomes available. Cochrane, in his excellent monograph Effectiveness and Efficiency [17] writes the following:

> "The main job of medical administrators is to make choices between alternatives. To enable them to make the correct choices they must have accurate comparable data about the benefit and cost of the alternatives. These can really only be obtained by an adequately costed *Randomized Controlled Trial.*"
>
> (italics mine)

Although there is some evidence to suggest that organized home care programmes are effective, they differ widely and the studies done are often less than scientific. The effectiveness study which is concurrent with this economic analysis will attempt to discover the health outputs of the programme in Hamilton-Wentworth for a particular group of patients. At the same time the cost-effectiveness analysis will attempt to answer the questions about the programme's efficiency. Thus the study will generate effectiveness and cost data at the same time, in the manner suggested by Cochrane. Both sets of questions need to be answered before the popular move toward home care results in its entrenchment as a usual practice to the point that rigourous scientific evaluation is not possible.

Models of Economic Evaluation

Economic analysts have developed several tools for analysis which are useful in the health field. The first of these, cost-benefit analysis, was first introduced for the evaluation of water resources projects under the Flood Control Act of 1936 in the United States[61,69]. The technique can be applied to a wide variety of public policy alternatives at one time since both costs and benefits are expressed in terms of dollars. Thus two programmes being compared need not have the same purpose or be hoping to produce the same health effects. For example, a comparative cost-benefit analysis might be made between a screening programme for cancer, the use of seat belts to prevent motor vehicle accident deaths and the development of public housing. The questions

asked of the comparison are whether or not each programme produces more dollar benefits than it costs and which of the alternatives maximizes these net benefits. For example, if Programme A costs less to mount and operate than Programme B, and it results in more productivity, then the net benefits (gross benefits minus gross costs) will be greater in Programme A. The weakness of cost-benefit analysis is that it requires the conversion of all outcomes ot dollars, which is often difficult with health outcomes that are less tangible than some others. Often this problem has led critics to point out that a programme which is economically preferable by cost-benefit analysis may not be preferable for other humanitarian reasons.

Cost-effectiveness analysis was developed by the United States Department of Defense in testing weapons systems where it was more reasonable to examine the number of objectives met at minimal cost rather than attempt to put a dollar value on the outcomes of military or naval manoeuvres [69]. The technique is useful for comparing different variations of a single programme (for example, home versus hospital dialysis) or different programmes where the same effects are expected as outcomes (for example, lives saved through hypertension screening or cancer treatment). Health effects may be expressed in a variety of ways such as life-years saved, millimetres of blood pressure reduction, number of deaths averted (lives saved) or number of diagnoses confirmed. While the approach eliminates the sometimes difficult problem of trying to put a dollar value on health outcomes, the limits are that one can no longer make statements about the amount of benefits that exceed costs

as in cost-benefit analysis. At best, a ratio of the number of health effects per unit cost can be developed and the programmes ranked in terms of their ability to maximize effects in relation to a specific unit of cost.

Cost-utility analysis (sometimes called the Health Status Index model) is a relatively new technique developed to attempt to measure the social benefit of real health outcomes of the type usually used in cost-effectiveness analysis [115]. Health effects are converted to a common unit (for example, the health utility day) where the common unit can be given a social value of some sort by various techniques. This measure is a subjective value placed on a health state rather than simply an objective measure of function as in some forms of health status index. Hence, although the costs only are measured in dollars, different programmes with different health effects can be compared because of this conversion to a common unit of outcome measurement which has some social value attached. Once can talk then about units of health utility across several different programmes. One example is the Quality Adjusted Life Year (QALY) suggested by Weinstein and Stason [121].

Cost-minimization, a special case of cost-effectiveness analysis, can also be called cost-comparison. It is simply the comparison of costs between two or more programmes where the health effects are identical and the goal is to choose the less costly alternative.

Principles Involved in the Use of Economic Analysis

The techniques of economic analysis and cost-effectiveness analysis in particular were designed to assist the decision-maker in identifying preferred choices for the allocation of scarce resources (in this case health care resources). The analytic techniques are tools only and will not make the decision, but rather point out in economic terms the efficiency consequences of different courses of action. The approach is relatively new to the health field, and is not without its problems in interpretation. For example, Doherty and Hicks [23] note:

> "Unfortunately, ... , cost-effectiveness has been politicized into demonstrating how a given program saves money. One hears, for example, expressions such as 'home care is more cost-effective than nursing home care', only to discover that cost is the important criterion and that relative effectiveness is discussed impressionistically at best, or, at worst, ignored ... The resulting confusion is especially evident in the helplessness with which administrative and evaluative arms of geriatric health care programs confront the now common request that they 'demonstrate cost-effectiveness' "

As will be discussed later in this chapter, many studies of the economics of home care programmes fall into this category of demonstrating 'cost-effectiveness' from the cost side only as a method of proving that home care saves money. Systematic cost-effectiveness approaches,

on the other hand, attempt to compare relative costs and effects in order to provide information in an organized way for decision-makers.

Economic analysis measures the comparative benefits or health effects of alternative uses of scarce resources in order to maximize benefits relative to costs. Implicit in all economic analyses is the idea that the resources used up by a programme are no longer available for some other use and therefore there are benefits foregone or effects lost as a result of this loss of resources. This is the concept of 'opportunity cost' which must be included in the measurement of the real costs of a health care programme. Hence, rents that are reduced, donated space or donated time have an opportunity cost attached to them which reflects the actual resources used up. Inherent in any economic analysis is the idea of comparison, wherein the resources used by one programme are compared to the resources used up by another, even if the other programme is merely the absence of the first, as in this study. This comparison acknowledges the concept that the resources not used up by the programme in the control group will produce other effects.

Cost measurement is a large component of economic analysis and must be done accurately in order to reflect the real costs of the programme alternatives. Costs in the sense used here are all resources used up or benefits foregone as a result of the programme. This is quite a different concept than the idea of either budget items or market prices, although either of these may on occasion to approximate cost. For example, some programmes may pay a reduced rent or even

no rent at all for office space through some arrangement with another agency. If the programme's budgetary allocation for rent were used to measure costs, then the real resources used up would be under-estimated. All costs associated with the space must be accounted for regardless of to whom they accrue. Costs also include benefits foregone (sometimes in the form of lost productivity or lost time) as a result of the programme. Two categories of cost are usually measured. Direct costs are those resources used up in relation to the programme. For example, the cost of supplies for nursing visits, the cost of the nurse's time, the administrative cost of the home care programme and the travel costs for volunteers who deliver Meals-on-Wheels are all direct costs of the programme. Indirect costs are those benefits foregone in order to participate in the programme. For example, time lost from work in order to attend a clinic results in lost productivity to the society as a whole. In the alternative of No Home Care, this might be the time that relatives take from work to care for an elderly person or to transport him to an out-patient clinic.

The last concept of importance in economic analysis is that of the viewpoint from which the analysis is done. The idea of examining the resource utilization and benefits naturally raises the question of to whom the resources belong and to whom the benefits accrue. Some costs will be borne by certain individuals, groups or segments of society. For example, with the universal health care insurance system in Ontario, the majority of health care costs are borne by the Ministry of Health and, through premiums and taxation, society as a whole.

The social viewpoint (sometimes called the comprehensive viewpoint) is the sum of all costs borne by all participants in the programme, including those that may not be reflected in some other viewpoint. For example, if the viewpoints of the individual patient, the government and society are being considered, there may be costs borne by persons other than the patient but outside the government's insurance coverage (such as volunteer workers). In these cases, the costs are included in the viewpoint of society. Usually, several viewpoints are considered within one economic evaluation and the costs within each viewpoint are analyzed in relation to overall health effects separately and independently of the others. Thus, in a study with three separate viewpoints, there will be three separate analyses of the data. The results can vary widely depending on where the costs lie in the alternative programmes.

Model, Viewpoints and Cost Definitions for This Study

In the economic evaluation described here, a cost-effectiveness model will be used. The alternatives of Home Care or No Home Care are expected to have health effects of the same type but not necessarily in the same magnitude. These health effects (physical function, social function and morale) would be difficult to convert to dollar values in the manner of cost-benefit analysis. The area of care for the elderly and chronically ill is one in which future research might focus on the development of health utility measurements such as health-utility-days. This would be a major research undertaking in itself, but would be much

more amenable to analysis and comparison with costs than the categorical measures to be used in this study as indicators of health effects.

For the purpose of this study, costs will be categorized in the following way. The first category has to do with all resources used up by either the Home Care programme or the No Home Care alternative. In the experimental or Home Care group this would include all costs for services and goods provided (for example, visiting nursing, meals or sick room equipment) plus any associated administrative costs, plus any costs that are incurred in order to allow the services to reach the patients (for example, transportation costs). This category of costs will be designated Direct Intra-Programme Costs. The control or No Home Care group is expected to generate similar resource use in relation to services which they can purchase on a private and individual basis and in relation to attending some clinic services that are otherwise provided in the home for experimental patients. These costs will also be designated direct intra-programme costs.

The second category of costs has to do with all resources used up by patients in either group for health services outside of the Home Care programme or the No Home Care programme. These services include physician's care, laboratory and x-ray services and institutional care in acute hospitals, chronic hospitals, nursing homes or homes for the aged. Since these services represent resources used up by the patients, they represent direct costs. The costs associated with these services are expected to differ between the experimental and control patients given that it is expected that the Home Care programme will have an

effect on patterns of utilization of these services. They are included as costs here in order to estimate the total costs associated with health service both within and as a result of the alternative methods of treatment. Costs in this category will be designated Direct Extra-Programme Costs. The sum of the intra- and extra-programme direct costs will then become the Direct Costs.

Costs associated with productivity lost in order to participate in the programme will consist primarily of lost work time of family members in order to care for or transport patients. These costs are expected to be greater in the control group than in the experimental group. Costs in this category will be designated Indirect Costs.

Costs and health effects will be analyzed within three points of view which are separate and independent. The viewpoints of interest are those of the individual patient and his family, the Ontario government and the society as a whole.

Economic Evaluations in Home Care

Some studies of specific treatments in the home for specific diseases or diagnostic types have been quite sophisticated in their approach to measuring costs and effects. For example, Klarman's work on chronic renal disease [60] and Fenton's recent work on psychiatirc home care [31] are of this type. In comprehensive programmes which provide multiple services to a variety of patients, like the one in Hamilton-Wentworth, evaluations are generally unsophisticated and of

the cost-minimization type or focus on the measurement of costs in the home care programme only. Health effects are usually described for the programme and assumed to be the same or worse in the alternative, which is usually hospital treatment. Economic evaluations of home care programmes which provide comprehensive, multi-service care are listed and classified in Table 2.1. For each study, the model and viewpoints used, the costs measured and the comparison of interest are indicated.

Several authors have described home care programmes for elderly and/or chronically ill populations and measured costs associated with the programme through budgetary expenditures. The costs measured are similar to the direct intra-programme costs to be used in this study, although it is not clear whether or not opportunity costs (for example, costs associated with donated space) are included. Since they are not described, it must be assumed by the reader that they are not considered. This problem is indicated in Table 2.1 with a single asterisk (*) in the direct intra-programme cost column in Table 2.1.

Colt and his colleagues [18] and Dale and Braund [22] measured costs in the way mentioned above and then went on to compare the daily or per diem rates between the programme and various forms of institutionalization. Walton and McNairn [119] have done a similar examination of the Hamilton-Wentworth programme for chronic patients. Widmer [122] measured costs in this way, but did not attempt to compare them to institutions. Inherent in the comparison of daily rates is the assumption that one day of care in home care is equal to one saved day in institutional care. Unfortunately, this assumption may not be valid

Table 2.1: Economic Evaluations of Multi-Service Programmes

Notes:

** Indicates that primary focus is on single programme costs with comparison to institution based on per diem rates

* Indicates that authors do not cite opportunity costs of the programme

Economic Evaluations (Ref.)	Models			Viewpoints				Costs Measured					Comparison	
	Costs Measured One Programme	Cost Minimization	Cost-Effectiveness	Government	Private Insurer	Patient/ Family	Society	Direct Intra-Programme	Total Direct	Direct and Indirect	Costs of Services Only	Per Diem Rates	Home Care / Institution	Home Care / Other Community
**1. Bryant, N.H. et al. 1974 (7)	x	x					x				x	x	x	
**2. Colt, A.M. et al. 1977 (18)	x	x					x	x*				x	x	
3. Creese, A. & Fielden, R. 1977 (21)		x		x		x	x			x			x	
**4. Dale, B. & Braund, M. 1968 (22)	x	x		x				x*				x	x	
5. Gerson, L. & Hughes, O. 1976 (36)		x		x				x*					x	
6. Hurtado, A.V. 1972 (55)		x			x			x*					x	
7. Ingbar, M.L. & Lee, S. 1964 (57)	x						x	x						
**8. Opit, L.J. 1977 (90)	x	x		x		x	x			x		x	x	
**9. Walton, L. & McNairn, N. 1978 (119)	x	x		x				x*				x	x	
10. Widmer, G. et al. 1978 (122)	x						x	x*						

and the pre diem rate is not an accurate reflection of the real resource utilization by a particular patient (see Chapter 5 and Appendix C). Bryant [7], in her study of stroke patients cited in Chapter 1, measured only the costs of service provided by the home care programme exclusive of overhead and administration costs. She then compared these to daily rates for hospitalization as in the other studies noted above.

Hurtado [55] examined the direct intra-programme costs (excluding opportunity costs but including costs of administration) in the same way as Colt [18] and others cited above. He compared these costs to costs per case in acute care and extended-care hospitals from the viewpoint of the private insurer, in this case the Kaiser-Permanente group. He found that because of the longer length of stay on home care the costs per case was $567.00 compared to $367.00 for institution. However, when translated into possible medical insurance premiums (from the viewpoint of the patient) these costs could be covered by $1.78 per year for home care and $5.72 per year for institution. Ingbar and Lee [57] in an early study of the home care programme at the Beth Israel Hospital in Boston, measured direct intra-programm costs in detail and described these in relation to specific segments of the home care population. This study included all aspects of direct intra-programme costs. They concluded that the organization of such programmes could be influenced by cost data and that there were certain services and categories of patients who, because of the distribution of these variables, had a major impact on the costs of the programme.

Several authors are also unclear as to the viewpoint from which the analysis is made [7,18,57,120]. The sources of revenue for the home care programme are government health care plans (Medicare), private insurers and the patients themselves via a fee for service. The proportions of revenues accounted for by each of these segments varies within and between programmes. Hence it is most likely that a comprehensive viewpoint which takes into account all three is the most appropriate one in these case.

Two well-designed and detailed studies of home care in the National Health Service in Great Britain have been reported. These are still of the cost-minimization type, but costs are measured in complete detail by the principles discussed earlier in this chapter. Opit [90] studied direct and indirect costs of domiciliary care for severely disabled people, with his primary focus on the home care programme. He then compared these costs to regular rates per day and per week for institutional care, acknowledging the crude nature of these rates as cost measures. He found little difference between the two, and postulated that the need to be selective in apportioning scarce resources could leave some patients who need service without it. Creese and Fielden [21] compared hospital and home care for severely disabled respiratory patients and measured direct and indirect costs in both alternatives. They concluded that home care was 2605 pounds less per year when direct costs alone were considered and 3074 pounds less when indirect costs are included as well.

Gerson and Hughes [36] studied a new programme in Newfoundland designed to reduce hospital stay in short-term acute care patients.

Effects were discussed in Chapter 1. In relation to costs, they measured direct intra-programme costs in the manner described earlier (that is, excluding opporunity costs). Hospital costs were measured partially by allocating fixed costs such as administration and overhead to nursing units and then to patient days, and partially by assessing levels of nursing care for patients and assigning a dollar value to a 'point' of care. The method for this partitioning of nursing care functions was developed by MacDonnell [73] and the focus is on technical nursing activities with little attention to the counselling aspects of nursing function. Their conclusion was that there was little difference between the two programmes overall in terms of costs. However, they point out that the randomization process used did not prevent a loss of experimental patients due to the novelty of the programme and resistance of attending physicians to using it. As a result, many experimental patients were in hospital as long as the control patients and the home care service was 'added on' to the usual form of care. This study differs from the present one in that the programme was for acutely ill patients, costs were not compared with health effects and the comparison was between hospital and home care rather than home care and the usual form of care in the community.

In summary, no studies were found that compared home care with the normal community experience of comparable patients. No studies were found that used a randomized trial format to obtain effectiveness data concurrent with cost measurement. No studies were found that attempted to compare detailed cost estimates with related health effects.

CHAPTER 3

DESIGN OF THE COST-EFFECTIVENESS STUDY

In this chapter, the cost-effectiveness study of the Hamilton-Wentworth Chronic Home Care programme for patients aged 65 and over with specified chronic diagnoses will be described in terms of its overall design. The concurrent randomized trial of the effectiveness of the programme will be outlined briefly. The alternative programmes of Home Care and No Home Care will be outlined and cost categories re-stated. The overall research question will be stated and further questions to be asked of the analysis itemized. Methods of summarizing cost data and effectiveness measures will be outlined.

Source of Effectiveness Data -- A Randomized Trial of Chronic Home Care

The evaluation study of the Hamilton-Wentworth Chronic Home Care programme is designed to determine its effectiveness for patients aged 65 and over with specific chronic disease diagnoses who are admitted to the programme at the point of discharge from acute care hospital. Patients will be assigned to experimental (Home Care) or control (No Home Care) groups based on a system of random allocation described below. Health effects of interest are physical function, social function and morale. In addition, data will be collected on compliance

with medical regimens and the difficulties encountered by care-takers in the home (that is, friends and/or relatives) as a result of having the patient there. Measurements will be taken at the point of entry into the study and at three and twelve months post-entry. In conjunction with the cost-effectiveness analysis, data will be collected on the utilization of health services external to the programme (and to the programme equivalents for the control group). These include physician's services, laboratory and x-ray services and institutional services. Patterns of utilization will be compared between the two groups.

Research Question

The major research question of the effectiveness study is: Will physical function, social function and morale be better in the Home Care group as compared to the control group?

Sample Specification and Allocation

Patients will be included in the study who (a) are aged 65 and over (b) have one of several chronic diseases listed in Table 3.1 which are commom to the current case-load (c) meet the eligibility criteria for the Chronic Home Care programme (see Appendix D) such as residence in Hamilton-Wentworth and medical supervision and (d) are at the point of discharge from either St. Joseph's Hospital or the Henderson General Hospital. Patients will be excluded who have been receiving Home Care prior to hospital admission, because this may systematically alter how well they do in the programme.

Table 3.1: Diagnoses for Inclusion in the Study

1. Emphysema	10. Chronic Ischaemic Heart Disease
2. Chronic Airways Obstruction	11. Heart Failure
3. Cardiovascular Disease	12. Congestive Heart Failure
4. Cardiovascular Atherosclerosis	13. Conductive Disorders
5. Cerebrovascular Arteriosclerosis and Atherosclerosis	14. Rheumatoid Arthritis
6. Senility	15. Osteoarthritis
7. Diabetes	16. Degenerative Arthritis
8. Old Myocardial Infarction	17. Lower Limb/Femur Fractures
9. Angina Pectoris	18. Neoplasms

Patients who meet the age and diagnostic criteria at either St. Joseph's Hospital or Henderson Hospital in Hamilton will be assessed using a standardized format by the Nurse Home Care Coordinator or the Nurse Research Assistant. Final eligibility decisions will be made by the Medical Advisor to the Home Care programme.

Patients will be allocated to the experimental group (Home Care) or the control group (No Home Care) based on the previous random allocation of the attending physician. All physicians who have admitting privileges at the two hospitals excluding obstetricians and pediatricians will be randomly allocated to experimental or control group. Patients who are eligible for the study and attended by experimental physicians will be admitted to Home Care after the physician and the patient have agreed to participate in the study. Eligible patients

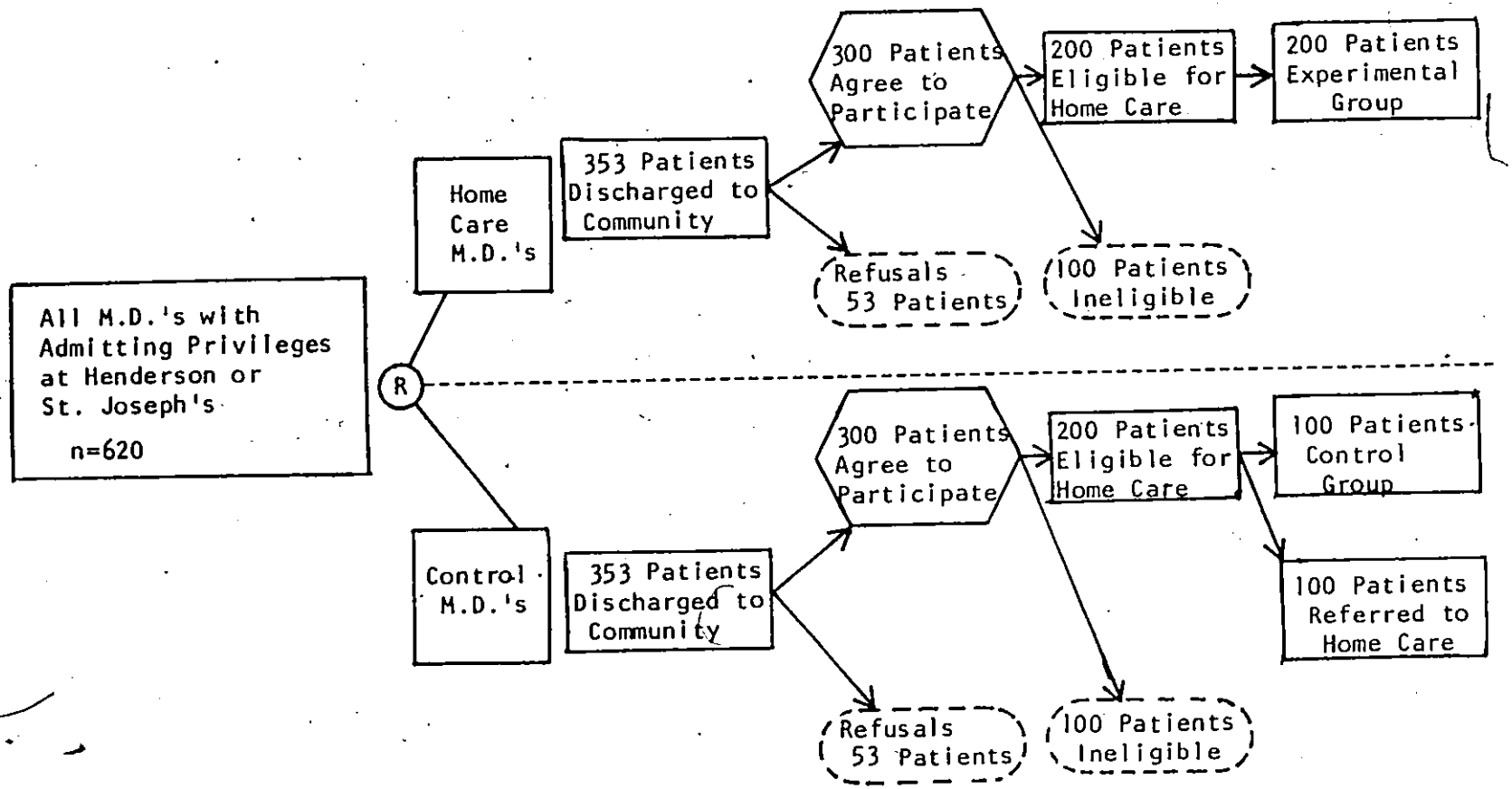
attended by control physicians will be asked to participate in a study following up elderly patients in order to determine their needs in the community without specific reference to the Home Care programme. Physicians in this group will be asked to participate in a similar type of study. Patients in the control group who are subsequently referred to Home Care will be followed separately.

Sample Size and Acquisition Sequence

Sample size calculations were based on predictions about hospital re-admission rates in each group and morale scores in each group. As a result of these calculations (see Appendix B), it was determined that samples of 94 patients who receive Home Care and 94 patients who do not receive Home Care were required. The investigators decided that they would aim for 100 patients in each of these groups as a measure of conservatism.

The sample acquisition sequence is illustrated in Figure 3.1. A pilot feasibility study that was conducted from January to March 1979 indicated that 50% of all patients who are eligible for Home Care will subsequently be referred and admitted to the programme in the age and diagnostic categories of interest. There is no restriction on the normal referral process built in to the allocation procedure. Hence it is expected that for every 2 patients allocated to the experimental group, there will be one control patient who has been referred to Home Care and one control patient who has not been referred to Home Care. After sample selection is complete, there will be 200 patients of

Figure 3.1: Sample Acquisition



experimental physicians who receive Home Care, 100 patients of control physicians who have been referred to Home Care and 100 patients of control physicians who have not received Home Care. At analysis, the primary focus will be on the experimental Home Care group compared to the control No Home Care group. Secondary analyses will look at other pairs such as the group of control patients who are referred to Home Care and a matched group of experimental patients.

Sequence of the Study

The study will begin in September 1979. After one month for start-up and training of nurse-interviewers for eligibility assessment, the sample acquisition phase is expected to last 8 months. All patients will be followed for 12 months from the time of allocation. Home visits and interviews will be done at 3 months after entry and at one year. Health service utilization data will be collected throughout in some instances (for example, physician visits) and at the end of the study period in others (for example, hospitalizations). It is expected that the entire study period, including time for analysis will take two years from the starting date and therefore the study should be completed in the summer of 1981.

Outcome Measurement

The health outcomes of interest in the effectiveness study are physical function, social function and morale. The first two of these will be measured using the Index of Health Questionnaire [97,13]. The scores will be classified in two ways: (a) good, fair or poor function

at the time of assessment and (b) improved, no change or deterioration from initial assessment (either at 3 or 12 months). Morale will be measured using the Philadelphia Geriatric Centre Morale Scale [65] and will be scored in the same way. At analysis, the scores in treatment and control groups will be compared to each other at the same point in time, and scores before the programme will be compared to those at 3 months and 12 months independently.

The investigators are also interested in the length of time between entry into the study and re-admission to hospital if it occurs. The hypothesis here is that the Home Care patients will be maintained in the community longer than the control patients, although they may still have to be re-admitted due to their age and the chronic nature of their disease. Both the number of re-admissions in each group and the length of stay in hospital at re-admission will be analyzed as well.

Hospital re-admission and other health service utilization data such as number and type of physician visits, admissions to chronic hospital and admissions to nursing homes will be collected throughout the study. Since these data are of primary interest due to the economic analysis, methods of data collection will be discussed in detail in Chapter 6 of this thesis.

Description of the Alternative Programmes

The Hamilton-Wentworth Home Care Programme is administered by the Hamilton-Dundas Branch of the Victorian Order of Nurses of Canada and is financed by the Ontario Ministry of Health. The programme

coordinates a number of professional and volunteer community services for its patients. Some of these are purchased from agencies already in place in the community such as Meals-on-Wheels, V.O.N. Visiting Nursing or Red Cross Homemaking. Others are provided by staff of the Home Care programme such as physiotherapy, occupational therapy and social work services. Patients have access to referrals to volunteer agencies such as Friendly Visitors and the Red Cross Loan Cupboard. In addition, patients on Home Care receive medical supplies, sick room equipment and reduced charges for special transportation for the elderly and handicapped when necessary. Physician visits are not financed by the Home Care programme and there are no physicians on staff for individual patient service, although there is a Medical Advisor who consults about cases. If the patient's physician chooses to visit the patient in his home, this is independent of the Home Care programme.

The services provided by the Home Care programme are listed in Table 3.2. The programme occupies a suite of offices in St. Peter's Centre, a Rehabilitation and Chronic Care facility in Hamilton. The suite is part of a larger group of offices rented from St. Peter's by the Victorian Order of Nurses. The Home Care programme rents its space, in turn from the V.O.N. The programme has a number of administrative and clerical staff members. Some of the nurse-coordinators are situated in area hospitals for assessment of potential patients and some are situated in the Home Care office for ongoing supervision of patients in the programme. The programme has staff members in the fields of physiotherapy, occupational therapy and social work as well. An organizational chart is available in Appendix D.

Table 3.2: Services Provided by the Home Care Programme

Service	Source	Description
1. Nursing	Public Health Nurses Victorian Order of Nurses St. Elizabeth's Visiting Nurses	Home Nursing Service
2. Physiotherapy	Home Care Staff	Physiotherapy in the home
3. Occupational Therapy	Home Care Staff	Occupational Therapy in the Home
4. Speech Therapy	Chedoke Hospital Staff	Speech Therapy in the home
5. Social Work	Home Care Staff	Social Services and Counselling
6. Homemaking	Visiting Homemakers Association Red Cross Homemakers Private Homemakers	Assistance with household tasks such as cooking, light cleaning
7. Meals-on-Wheels	Victorian Order of Nurses Macassa Lodge Dundas Meals-on-Wheels	Hot meals delivered up to 5 days/week; one meal daily

...continued

Table 3.2 (continued): Services Provided by Home Care

Service	Source	Description
8. Transportation	Private Taxi DARTS Bus Ambulance	Transportation to health-related facilities
9. Friendly Visitors	Victorian Order of Nurses	Volunteers who act as friends to patients
10. Drugs	Community pharmacies	Patients have their drugs paid for by the Home Care programme
11. Dressings and Sickroom Equipment	Home Care Office Red Cross Loan Cupboard Community Suppliers Victorian Order of Nurses	Equipment and Dressings are paid for by the Home Care programme
12. Laboratory and X-ray Services	Public or Private Laboratories	Where a private laboratory or x-ray service charges more than what is covered by O.H.I.P. the difference is paid by Home Care.

Patients in the control group who do not receive Home Care are able to purchase certain services (for example, visiting nursing, meals-on-wheels) in the community privately and may or may not do so. Other services (for example, occupational therapy) are not available in this way. It is expected that control patients will not make as much use of services available for purchase on an individual basis as patients in the organized Home Care programme. Although some services (for example, visiting nursing, out-patient clinic physiotherapy) require a physician's referral for admission, there is no reason to assume that the referral could not be made independent from the Home Care programme. Moreover, a number of services have multiple access points such as self-referral or referral from another agency. Some examples of services that operate this way are the Red Cross Loan Cupboard, Friendly Visitors and Meals-on-Wheels. Some functions, such as home-making may be performed by family members. The services that may be purchased from agencies or provided by family and friends are listed in Table 3.3.

Viewpoints

There are three viewpoints of interest in this study, as mentioned in Chapter 2. First, the Ontario government, as financer of the Chronic Home Care programme and most other health services throughout the province by way of the Ontario Health Insurance Plan and the Personal Health Division of the Ministry of Health, will have a major

Table 3.3: Availability and Source of Parallel Services for Control Patients

* Service not available in the home

Service	Available?	Source
1. Nursing	Yes	Victorian Order of Nurses St. Elizabeth's Visiting Nurses Public Health Nurses
2. Physiotherapy	Yes*	Hospital Clinics or Private Practitioners' Offices
3. Occupational Therapy	No	
4. Speech Therapy	Yes*	Chedoke Hospital
5. Social Services	Yes	Existing Social Agencies e.g. Hamilton-Wentworth Family Service Agency
6. Homemaking	Yes	Visiting Homemakers Red Cross Homemakers Private Homemakers
7. Meals-on-Wheels	Yes	Victorian Order of Nurses Macassa Lodge Dundas Meals-on-Wheels
8. Transportation	Yes	Private Car Private Taxi DARTS Bus Ambulance
9. Friendly Visitors	Yes	Victorian Order of Nurses
10. Drugs	Yes*	All patients over age 65 are covered by the Ontario Drug Benefit Plan
11. Dressings and Sickroom Equipment	Yes*	Red Cross Loan Cupboard Community Suppliers
12. Laboratory	Yes*	Public or Private Laboratories

interest in the costs it will incur with or without the programme. Second, the patient and his family will have different costs depending on whether or not they are participating in the programme. Since many elderly people are dependent in some way on family members, it would be difficult to separate their interests. The third, comprehensive or social viewpoint is the sum of all costs borne by participants in the programme where 'participants' in this sense means all constituents who bear costs. In other words, although the Ministry of Health is not a participant in the programme in the same way that a patient is, it is 'participant' in the sense of being responsible for bearing certain costs. In addition, there will be some costs that do not accrue to other viewpoints but do accrue to the societal point of view, such as lost productivity and volunteer time.

Categories of Costs and Cost Summaries

As described in Chapter 2, the direct costs represent all resources used up in the provision of or as a consequence of the programme in either group. These are sub-divided into direct-intra-programme costs which are generated by the programme (in the Home Care group) or the programme equivalent services (in the No Home Care group), and direct extra-programme costs which are generated by health services outside of the programme itself (in either group). Indirect costs in either group include the costs of productivity lost as a result of participation in the programme.

In the experimental group, the direct intra-programme costs are all those associated with the services listed in Table 3.2 (including administration costs of the individual services) plus costs of administration of the programme and costs of transportation for workers to deliver services at home. In the control group, the direct intra-programme costs are those associated with the services listed in Table 3.3 (including administration costs) plus any associated costs of transportation to either patients or workers.

In each group, the direct extra-programme costs are those associated with physician services, laboratory and x-ray services and institutional services, including hospitals, nursing homes and homes for the aged. Patients are expected to generate costs borne by the government and possible by themselves as a result of physician services. If the Home Care programme is meeting its stated goals of maintaining function and preventing deterioration, we would expect to see fewer readmissions to hospital or admissions to long-term institutions in the experimental group. This should be reflected in the extra-programme costs.

Indirect costs usually are measured in terms of lost time from productive work, although there is a controversy in economic circles about counting lost leisure time in a similar way. This will be discussed in Chapter 4 in relation to valuing volunteer time. Since all patients in this study are aged 65 or over and chronically ill, it is expected that none of them will be employed. However, family members or others who act as caretakers in the home may lose time from work

in order to transport them to health care facilities or to assist them in their home.

All costs are summarized and analyzed separately within each independent viewpoint. In each cost category, the total costs are equal to the sum of all costs per individual patient over all patients in that group (experimental or control). The sum of the total direct intra-programme costs and the total direct extra-programme costs is equal to the total direct costs. Average costs per patient in each category are calculated by dividing the total costs by the number of patients in the group. This average figure attempts to measure the 'usual' costs for one case (in any viewpoint), at least in these groups of patients in these programme alternatives.

In order to estimate the costs of the Home Care programme that are 'added on' to the usual costs of the alternative of No Home Care or the reverse, which can be referred to as costs reduced in Home Care compared with the alternative, incremental costs are used. This is done by subtracting the total costs for No Home Care (within a category or overall) from the total costs for Home Care. If the difference is a positive number, then the incremental costs are added to the costs of the usual form of community care. If the difference is negative, then the 'savings' with the Home Care programme as compared to the usual form of treatment represent saving for that group of patients and within the context of this comparison. This does not mean that there are necessarily savings within the total health service costs for the region since the Home Care programme may generate more expenditures in other parts of the system (see Appendix C).

In order to determine the costs which are 'added on' to or 'saved' from the usual costs of care in the community by the Home Care programme for one patient, the incremental costs per case are used. These are calculated by subtracting the average costs per case in the No Home Care group from the average costs per case in the Home Care group.

All cost summaries and calculations are done separately within each viewpoint. Each cost category can be summarized and analyzed independently from other categories. Overall costs, meaning the sum of all categories can be treated in a similar way.

The symbols that will be used to develop cost equations are listed and defined in Tables 3.4 and 3.5.

Table 3.4: Symbols Designating Costs

Symbol	Meaning	Symbol	Meaning
C	Cost	ΔC	Incremental Cost
Pt	Per Patient	Int	Intra-Programme
T	Total	Ext	Extra-Programme
D	Direct	C_e	$Cost_{experimental}$
I	Indirect	C_c	$Cost_{control}$
$\overline{C}$	Average Cost	CPt_i	Costs per the ith Patient
$\Delta\overline{C}$	Incremental Cost per Case	n	Number of patients in one group

Table 3.5: Cost Designations Across All Categories

		SUB-CATEGORIES				
		Per Patient	Total	Average	Incremental	Incremental Per Case
CATEGORIES	Overall	PtC	TC	$\overline{C}$	ΔC	$\Delta\overline{C}$
	Direct	PtDC	TDC	$\overline{DC}$	ΔDC	$\Delta\overline{DC}$
	Intra-Programme	$PtDC^{Int}$	TDC^{Int}	$\overline{DC}^{Int}$	ΔDC^{Int}	$\Delta\overline{DC}^{Int}$
	Extra-Programme	$PtDC^{Ext}$	TDC^{Ext}	$\overline{DC}^{Ext}$	ΔDC^{Ext}	$\Delta\overline{DC}^{Ext}$
	Indirect	PtIC	TIC	$\overline{IC}$	ΔIC	$\Delta\overline{IC}$

*If the subscript$_e$ is used, the costs are for the experimental group. If the subscript$_c$ is used, the costs are for the control group.

Cost Equations

The equations that will be used to summarize costs will be listed here. The details of cost measurement and tables of the various components of cost categories are outlined in Chapters 4 and 5. The approach to cost measurement is the "ingredients" approach described by Levin [69] whereby all components of each cost category are listed and costed then summed to yield overall costs for that category.

1. INDIRECT COSTS

Per Patient $PtIC$ = Sum of all costs for lost productivity and/or leisure time of the patient and his family (1)

Total $TIC = \sum_{i=1}^{n} Pt_i IC$ (2)

Average $\overline{IC} = \frac{TIC}{n}$ (3)

Incremental $\Delta IC = TIC_e - TIC_c$ (4)

Incremental Per Case $\Delta\overline{IC} = \overline{IC}_e - \overline{IC}_c$ (5)

2. DIRECT INTRA-PROGRAMME COSTS

Per Experimental Patient $PtDC_e^{Int}$ = The sum of the costs of (1) nursing + (2) speech therapy + (3) occupational therapy + (4) physiotherapy + (5) social service + (6) homemaking + (7) meals-on-wheels + (8) medical supplies + (9) drugs + (10) sick room equipment + (11) transport + (12) Friendly Visitors + (13) administration. (6)

Per Control Patient $PtDC_c^{Int}$ = The sum of the costs of services parallel to (1) - (12) in the Home Care group. (7)

Total $TDC^{Int} = \sum_{i=1}^{n} Pt_i DC^{Int}$ (8)

Average $DC^{Int} = \frac{TDC^{Int}}{n}$ (9)

Incremental $\Delta DC^{Int} = TDC_e^{Int} - TDC_c^{Int}$ (10)

Incremental Per Case $\Delta DC^{Int} = \overline{DC}_e^{Int} - \overline{DC}_c^{Int}$ (11)

3. DIRECT EXTRA-PROGRAMME COSTS

Per Patient (either group)	$PtDC^{Ext}$	=	The sum of all costs associated with (1) physician services + (2) Laboratory and X-ray + (3) Institutional Care	(12)
Total	TDC^{Ext}	=	$\sum_{i=1}^{n} Pt_i DC^{Ext}$	(13)
Average	$\overline{DC}^{Ext}$	=	$\frac{TDC^{Ext}}{n}$	(14)
Incremental	ΔDC^{Ext}	=	$TDC_e^{Ext} - TDC_c^{Ext}$	(15)
Incremental Per Case	$\Delta\overline{DC}^{Ext}$	=	$\overline{DC}_e^{Ext} - \overline{DC}_c^{Ext}$	(16)

4. DIRECT COSTS

Per Patient	$PtDC$	=	$PtDC^{Int}$	+	$PtDC^{Ext}$	(17)
Total	TDC	=	TDC^{Int}	+	TDC^{Ext}	(18)
Average	$\overline{DC}$	=	$\overline{DC}^{Int}$	+	$\overline{DC}^{Ext}$	(19)
Incremental	ΔDC	=	TDC_e	-	TDC_c	(20)
Incremental Per Case	$\Delta\overline{DC}$	=	$\overline{DC}_e$	-	$\overline{DC}_c$	(21)

5. OVERALL COSTS

Per Patient	PtC	=	$PtDC$	+	$PtIC$	(22)
Total	TC	=	TDC	+	TIC	(23)
Average	$\overline{C}$	=	$\overline{DC}$	+	$\overline{IC}$	(24)

5. OVERALL COSTS (continued)

Incremental $\Delta C = TC_e - TC_c$ (25)

Incremental Per Case $\Delta\bar{C} = \bar{C}_e - \bar{C}_c$ (26)

Summary of Health Effects

As stated earlier, the health effects of interest are physical function, social function and morale. Data related to each functional outcome will be categorized either as good, fair or poor function. These scores can then be compared in terms of improved function, no change in function or deteriorated function as in Table 3.6 for each question and summarized to each functional area. These data will be analyzed using various Chi-square techniques of statistical analysis as described in Appendix B.

The outcome measures that will be useful for comparison with costs, and an explanation of each are listed in Table 3.7.

Table 3.6: Analysis of Improvement in Functional Outcomes

		TIME 1		
		Good	Fair	Poor
TIME 2	Good	NO	BETTER	
	Fair	WORSE	CHANGE	
	Poor			

Table 3.7: Outcome Measurements of Interest for Economic Analysis

Outcome	Explanation
1. Number Improved [Percent Improved]	Describes the number/percentage of patients in each group who improved over the period of the study in each function.
2. Number No Change [Percent No Change]	Describes the number/percentage of patients in each group who showed no change in function over the study period.
3. Number /percent Good or Fair Function	Describes the number of patients with good or fair functional status at outcome assessment.
4.* Net or Extra Improvement with Home Care	Describes the increase (if any) in the "Improved" category with Home Care
5.* Net or Extra Maintenance with Home Care	Describes the increase (if any) in the "No Change" category with Home Care
6.* Net or Extra Good or Fair function with Home Care	Describes the increase (if any) in the proportion of Good or Fair function scores with Home Care

* Examples of these are given in the text.

While the negative outcomes of poor function and deteriorated over the study period are of interest and will be counted, they are not of interest ot the primary analysis. The outcomes of fair function and no change over time are included as positive outcomes since these reflect the maintenance of function which is a goal with the Chronic Home Care programme.

The number and percentage of patients with good function and with improved function will be assessed in each group. Then the number

of patients with good function will be combined with the number with fair function. Similarly, the number improved will be combined with the number showing no change in function. Then health effects of good or poor function and improved or deteriorated can be compared with costs for each group.

If there is 'improvement' in 20% of the Home Care group, and in 15% of the No Home Care group, then the net or extra improvement with Home Care is 5%. If this refers to 20 improved patients in the Home Care group, and 15 improved patients in the No Home Care group, then there are 5 extra improved cases with Home Care. Similarly, if there are 5 extra cases showing no change with Home Care, then there are 10 extra cases showing improvement or no change. If 30% of the Home Care patients are functioning at a 'good' level at one year's follow-up and 20% of the control patients are similar, then the extra or net good functioning with home care is 10% or 10 patients.

There are a number of outcomes in the area of health service utilization (as opposed to functional health outcomes) which are of interest to the effectiveness study. These include number of hospital re-admissions, number of admissions to other institutions, number of physician visits, length of stay in hospital at re-admission and length of stay in the community before re-admission. All of these are counted on the cost side of the cost-effectiveness ratio when the analysis is done with total costs or total direct costs. It would therefore be inappropriate to consider them as health effects for the economic analysis in this instance because they would be counted twice and would cancel out. However, when considering programme costs only these outcomes

could be compared to costs in a manner similar to the functional outcomes.

Research Questions

The overall research question is:

> What are the relative costs and health effects of Chronic Home Care in Hamilton-Wentworth for patients aged 65 and over and discharged from hospital with specified diagnoses, compared to the usual treatment practices in the community from the separate and independent viewpoints of (a) the government of Ontario (b) out-of-pocket expenses for the patient and his family and (c) all constituencies to whom costs may accrue.

Specifically, several questions will be asked at the time of analysis of the accumulated cost and effectiveness data. These are posed separately within each viewpoint and, in some cases, separately within various cost categories.

1. What are the incremental costs of the Home Care programme when compared with No Home Care within each of the cost categories of interest (overall costs, total direct costs, direct intra-programme costs, direct extra-programme costs and indirect costs) ?
2. What are the incremental costs per case in the Home Care programme when compared with the No Home Care programme within each category of costs?

3. Within each category of costs, what are the total costs and the average costs per case of the No Home Care programme and the Home Care programme?
4. Within each category of costs, what is the variation among patient costs as measured by the standard deviation about the mean?
5. Within each category of costs, is there a significant difference between the mean costs per case in the Home Care group and the mean costs per case in the No Home Care group, using a t-test for independent means and a probability of a Type I error of $\alpha=0.05$?
6. Within each category of costs, what are the total costs of the Home Care programme in relation to:
   (a) the number or percentage of 'improved' patients?
   (b) the number or percentage of patients showing improvement or no change in function?
   (c) the number or percentage of patients in the categories of 'good' or 'fair' function at final assessment?
7. What is the average cost per (a) improved or unchanged case in Home Care or No Home Care and per (b) patient with 'good' or 'fair' function at final assessment in Home Care or No Home Care?
8. What is the cost for one additional case of improved or unchanged function or of good or fair function in the Home Care group?
9. What is the incremental cost per additional case of improvement in function or unchanged function or of good or fair function in Home Care?

Assumptions

One aspect of this study which makes it different from many other cost-effectiveness studies is the fact that it is designed to be carried out in conjunction with a randomized controlled trial of the clinical programme or manoeuvre in question. As a result, in many areas where assumptions would normally be required to describe the 'clinical' course of the patients there will be actual data which can be summarized for cost and effectiveness measurement purposes. Thus the health effects, resource utilizations and patterns of service for each patient in each group will be available for economic analysis. Several assumptions will be made in relation to cost measurement and will be discussed in Chapters 4 and 5. The randomized trial format allows the investigator to make some generalizations about the effects of Chronic Home Care for similar gorups of patients in similar programmes over the same period of time, and this is also true of the cost-effectiveness results. In this case, the generalizations are based on the assumption, generally accepted, that the randomization procedure ensures representativeness in the sample of patients studied and that the sample size ensures the prediction of the general case based on the probability limitations placed on the likelihood of error in the statistical tests used.

CHAPTER 4

COST MEASUREMENT I: PRINCIPLES, CATEGORIES AND INTRA-PROGRAMME MEASURES

In this chapter, general principles of cost measurement and those specific to this study will be reviewed. Categories of costs and their components in the Home Care programme and the No Home Care programme will be listed. Cost measurement for the direct intra-programme costs in both groups will be discussed in detail.

General Principles of Cost Measurement

The measurement of costs or resource inputs into the programme alternatives under study is of central importance in cost-effectiveness analysis. In the health and public service field in particular, the process can be complex and care must be taken to achieve as close an approximation of the true resource used up as possible. Although cost measurement may on the surface appear to be merely a case of listing the services used in each group and applying a market price, this will underestimate the true costs. Costs in economic terms include all resources used up or benefits foregone in the course of the programme. In this definition then, the economic analyst must examine not only what you "pay" for a programme, but also the opportunity cost of what benefits might have accrued if the resources had been available for some

other use. For example, in this study the office space used by the hospital-based Home Care Coordinators is donated to the programme. However, if this space were available it would be used for some other programme and therefore an opportunity cost must be assigned.

In other cases, the usually accepted market price may overestimate the resources used by the programme in question. In the case of hospital costs, for example, the daily or per diem rate is often used to represent costs [see 7,18,22,90,119]. This figure is calculated by dividing the net operating costs of the facility over a year by the number of patient days in that year [86]. The net operating costs are obtained by taking the total gross expenditures and subtracting certain non-allowable revenues such as certain out-patient revenues and some cafeteria revenues. This is the method of calculation for Ontario but similar methods are used in most places. The per diem rate used to be a device by which this year's expenditures could be used to predict next year's costs and therefore budget requests. In fact, with global budgets the per diem is rarely used by hospital accountants except to bill non-resident patients who are not insured.

The per diem rate does contain components that will underestimate the costs of patient care in some cases and overestimate them in others. For example, a patient at the point of discharge and shortly before is not using many of the hospital services such as complex diagnostic equipment, surgical resources and delivery suites. The per diem rate includes costs which may not be directly related to patient services such as research and education. In as much as the per diem

rate for hospitals is often considered analagous to a market price for some other ingredients of a programme's costs, the same principle holds. Market price alone cannot be used to estimate costs of many services, and in the case of each cost component, all resources must be considered.

As described earlier, the costs of any health care programme can be categorized as direct (meaning resources used up by the programme) and indirect (meaning productivity lost in order to participate in the programme). To the economist, this loss of productivity is not seen primarily as being borne by the individual in the form of wages lost, but rather by the community in the form of productive output lost. However, based on reasonable assumptions about the participants in the programme and the time lost from work, dollar values are often placed on this lost productivity using wage rates as the best estimators available.

The cost of time lost from work can be measured using wage rates as described above in relation to employed individuals. However, many people also use leisure time to participate in a programme or act as volunteers for a social agency. In this cost-effectiveness study, the issue of valuing leisure time arises in relation to several cost components. Some services such as Meals-on-Wheels or Friendly Visitors rely primarily on volunteer workers. Patients are all over 65 and therefore not likely to be part of the labour force. Time given by family and friends to care for or transport patients may be leisure time.

The issue of valuing leisure time is a controversial one in economic analysis. On the one hand, from a societal point of view, this time is not available for other pursuits and, in the case of

volunteers, workers would have had to be paid in their absence. If costs are not assigned to leisure time lost, volunteer time or time lost by persons outside the work force because of age or employment status, then we are saying that the economic value of this time to society is zero. On the other hand, time spent by family or friends with patients in this study and which is part of their leisure time may be assumed to be given by choice. In other words, they have revealed their preference to spend their time in this way rather than in some other pursuit. Therefore there are no opportunity costs associated with this time because nothing has been foregone. Moreover, since leisure pursuits do not contribute to society in the sense of being included in the Gross National Product, then there is no productivity associated with leisure time in economic terms. In this sense, leisure time should be treated as an intangible cost and counted in numbers of hours but not assigned a dollar value. Levin [69] advocates including lost leisure time in cost measures, but in this nominal or categorical way. The approach to lost leisure time and volunteer time will be discussed later in this chapter.

One factor which should be brought into play when considering the issue of valuing leisure time, and with all other costs, is the importance of any cost component to overall cost estimates and/or the operation of the programme. Many cost measurements can become complex as the resources used up are listed and data collected about their magnitude. For example, the step-down costing approach to measuring hospital costs which is described in Chapter 5, is a complex and time-consuming process. Some of the data collection procedures for counting

things like distance travelled to clinics or number of visits from relatives to do housework are also time-consuming for study staff and difficult to control in terms of reliability. Hence, as Levin has pointed out, when a large number of cost estimates for different components of a programme must be developed, methodological rigour must be tempered with practical considerations of where the most significant effort should be placed. It would be inappropriate to spend an inordinate amount of time and effort with a detailed method for costing a part of the programme which is small in proportion to other components or is considered not central to the health outcomes of patients. It is equally inappropriate to spend too little time on an overly simple or incomplete estimation procedure for a component of the programme which is responsible for a large portion of the costs.

Finally, costs may accrue to the alternative programmes under study over time. It is important for comparison purposes that all costs in the study be expressed in terms of the constant dollars of some base year. For example, if a study is examining a programme mounted in 1979 in terms of 1979 dollars, then benefits or costs incurred over later years must be discounted to 1979. In other cases, this involves the use of a price index (for example, the Consumer Price Index) to estimate 1979 prices from data on prices of an earlier year. Discounting is used on the assumption that resources available now will be more valuable to individuals and society than at some time in the future. Indexing is used as an attempt to account for the inflationary rise in prices that occurs over time. In cost-benefit analysis, both costs and benefits (expressed in dollars) can be discounted using

a specific rate of discount. In fact, most analyses include several discount rates in order to determine the effect of alteration in this rate on the overall results. The choice of discount rate or the 'social rate ot time preference' which should apply is a decision made by the policy-makers or administrators based on a wide variety of data rather than by the economic analyst.

The issue of similarly discounting health effects is a controversial one where there seems to be agreement that health effects now may in fact be worth more than at some time in the future (in terms of social value) but there is disagreement as to the methods to use. This controversy centres around how to do the discounting of effects, namely; through the use of the same discount rate as for costs or through the use of a special discount rate derived for the health effect(s). In the study in question, there is no need to apply discounting since all costs and effects occur in the same time frame. The analysis will use 1980 as a base year and 1980 prices for cost measurement. Indexing will be used in some instances where the only prices available will be from an earlier year.

Specific Principles of Cost Measurement

The following itemized principles will apply to all cost measurements in this thesis.

1. For a majority of services available in the Home Care programme, market prices will be available and will be used for cost measurement.

Where the market price contains a portion which represents costs of administration and overhead for the service agency, then the market price alone can be used. For example, the cost per nursing visit can be multiplied by the number of nursing visits for any one patient to yield an overall cost for nursing visits for that patient. Where the market price does not include administration and overhead costs, the cost measurement will consist of the market price plus a cost for administration and overhead. For example, if the cost to the patient for one meal in Meals-on-Wheels is $1.25, and there is an administration cost of $0.30 per meal, then the cost per meal is $1.55. Methods for arriving at these administration and overhead costs will be outlined in the detailed section on cost measurement.

2. Overhead and administration costs in the Home Care programme will be allocated to each case in the following way. All components of costs of overhead and administration will be listed (for example, space for offices, staff, equipment, medical advisor's salary). Some of these will not have any input into the Chronic Home Care programme, such as those staff members, offices or equipment that are used only by the Active treatment patients. All components not relevant to the Chronic programme will be excluded. Those components that are exclusive to the Chronic programme will be used to determine one portion of the costs per case. The second portion will be obtained by dividing those resources that are shared by the Active and Chronic programmes (for example, certain clerks, offices, hospital nurse-coordinators) by some factor to yield the costs exclusive to the Chronic ~~case load~~.

These can then be used to determine the second portion of the administration and overhead costs per case.

3. An average of current market prices will be used to measure costs of nursing homes, homes for the aged and retirement homes. Since these agencies are in the private sector, the market price is assumed to accurately reflect the resources that will be required from the government and/or the patient and his family. In some cases, the government will pay a portion of the costs of nursing home care, with the patient and his family contributing a nominal daily fee. In these cases the government portion will be assigned to that viewpoint.

4. Costs of physicians' services will be measured using the Ontario Health Insurance Plan billing code and the related price as listed in the Ontario Health Insurance Plan Schedule of Benefits [87]. Where the physician has opted out of the plan, and charges the patient an additional fee, the cost will be measured by using the Ontario Medical Association suggested fee schedule and assuming that the variation between those who charge over this amount and those who charge under it will balance out[83]. This portion of the cost will be borne by the patient and his family.

5. Hospital care will be costed using a step-down cost allocation method devised by Evans and Robinson in British Columbia [30]. Costs will be measured at the Chedoke Hospitals in Hamilton which is considered representative and has some advantage over others as will be described in Chapter 5. Costs for an acute day of care, a rehabilitation day of care and a chronic day of care will be developed by this method

and applied to the number of acute, rehabilitation or chronic days of care for each patient in order to estimate hospital costs. Costs for the office space donated to the Nurse-Coordinators will also be developed with this method. Costs for emergency room visits will be developed separately by survey of the records of all hospitals in the area that have emergency rooms, and then adding on a portion of the overhead and administration costs of the hospital by square feet of floor space occupied by the emergency service.

Where patients are charged a chronic care fee after 60 days in a chronic care bed or facility [53], the rate which is in effect in 1980 will be applied to the number of days (exclusive of the first 60) in care and assigned to the patient/family viewpoint.

6. The opportunity costs of donated space or maintenance services or reduced rent for offices in the Home Care programme (if these are present) will be a sub-component of the overhead and administration costs. These opportunity costs will be determined by assessing the comparable costs of similar space in the adjacent hospital by budget review. In the case of donated space, the total opportunity costs measured in this way will be used. In the case of reduced rents, the total comparable costs will be used. However, in this latter situation, only the difference between the rent and the imputed cost of the space represents the opportunity cost.

7. Families of patients in either group may supplement services provided by Home Care. Notably, it is likely that some form of home-making services will be provided in this way. Where this donated time

comes from an employed family member or friend, and time is lost from work in order to provide this service, the opportunity cost will be measured by applying the number of hours donated to the wage rate for the type of work normally done by the family member. Where the donated time comes from people who are too old (aged 65 and over) or too young (less than 15) to be employed or from unemployed others, then this is lost leisure time which is discussed in the section below.

8. The time given up by family members as above to provide service, the time given up by patients and their families in order to participate in a programme (in this case the control programme primarily) and the time donated by volunteers in such services as Meals-on-Wheels or Friendly Visitors are (where the individual is not employed) all examples of leisure time given up in providing or as a result of the programme. The following guiding principles will apply to this controversial area.

(a) It is expected that the costs associated with donated time (however measured) will not be a large component of the overall costs, and the impact of volunteer services such as Meals-on-Wheels and Friendly Visitors in relation to outcomes will be small in comparison to criterion services such as nursing or physiotherapy.

(b) During data collection at personal interview and from the volunteer agencies, estimates of donated time will be made and collected longitudinally in order to at least describe qualitatively the 'intangible' costs of this time.

(c) In the case of time donated by family and friends for service substitution or transport of patients, it will be assumed that this

time is given by choice and a preference is revealed for this use of leisure time over others. Hence no dollar value need be applied to this time.

(d) In the case of the leisure time lost by patients in order to attend clinics and the like (mainly control patients) the time will be considered as not given by choice, and a dollar value will be obtained by multiplying the number of hours by the Ontario Minimum Wage as published by the Ministry of Labour [89].

(e) In the case of time donated by volunteers to services such as Friendly Visitors or Meals-on-Wheels, it will be assumed that their participation indicates a desire to be productive and that they might be in the labour force if not working as volunteers. Therefore the time here will be valued as with patient lost leisure time.

(f) The impact of these costs on overall cost totals will be challenged by sensitivity analysis through removing the costs of patient lost time and volunteer time and, separately, by costing the lost leisure time of family and friends using the Ontario Minimum Wage [89].

(g) It is accepted as a guiding principle that there is no 'right' or 'wrong' answer in this issue, but rather two different ways of estimating the 'state of the world' in each alternative programme.

9. There may be differences in costs due to price variations which may or may not reflect differences in resource use. For example, medical supplies are purchased by the Home Care programme at a reduced rate, thus a difference will be apparent between the Home Care group and the control group due to this price variation even if the number and type of supplies used are equal. In cases where there is a price

variation for what looks like the same service, the price obtaining (that is, the price that is really charged to these groups) will be used initially and then sensitivity analysis will be done to attempt to estimate the effects of the price variation for the same services on the potential cost differences between the groups.

10. The base year for cost measurement will be 1980. Since all services will be given within the one year period of the study and the cost measurements will be done in 1981, the 1980 prices will be the most recent available. Where prices from earlier years are used (for example wage rates for employed persons) the Consumer Price Index[108] will be used to convert these prices to 1980 equivalents. Since there are no costs that will occur in the future there will be no need for discounting in this study.

Categories of Costs in Home Care and No Home Care

The components of the cost categories for the Home Care group are itemized in Table 4.1 and the viewpoint(s) of interest for each component are indicated. Similarly, the components of the cost categories for the control group are outlined in Table 4.2. The Direct Intra-Programme Costs for both programmes will be discussed below. Chapter 5 will outline the cost measurement strategies for the Direct Extra-Programme Costs and the Indirect Costs in both groups.

Table 4.1: Cost Components -- Home Care Group

Note: x = cost will be monitored

COSTS	VIEWPOINTS: GOVERNMENT: Ministry of Health O.H.I.P.	Ministry of Health Institutional Care	Ministry of Health Health Services	Ministry of Community and Social Service	Individual & Family	Comprehensive
I. DIRECT COSTS (DC_e)						
A. INTRA-PROGRAMME COSTS (DC_e^{int})						
1. Nursing (V.O.N., St. Elizabeth's, Public Health Nursing)			x			x
(a) Private Nursing (if applicable)					x	x
2. Physiotherapy (Home Care Staff)			x			x
3. Occupational Therapy (Home Care Staff)			x			x
4. Speech Therapy (Chedoke Hospital Staff)			x		x	x
5. Homemaking (Visiting Homemakers, Red Cross, Other Private)			x	x	x	x
6. Social Work (Home Care Staff)			x			x
7. Meals-on-Wheels (V.O.N., Macassa, Dundas)			x	x	x	x
8. Transportation (including ambulance)	x		x		x	x
9. Drugs			x			x
10. Sickroom Equipment			x			x
11. Medical Supplies			x			x
12. Friendly Visitors				x		x

....continued

Table 4.1: (continued) Cost Components -- Home Care Group

COSTS	VIEWPOINTS: GOVERNMENT: Health O.H.I.P.	Health Inst.	Health Services	Comm. and Soc. Serv.	Ind. & Fam.	Comp.
I. DIRECT COSTS (cont'd)						
A. INTRA-PROGRAMME COSTS (cont'd)						
13. Administration and Overhead			x			x
TOTAL INTRA-PROGRAMME COSTS (TDC_e^{Int})			x	x	x	x
B. EXTRA-PROGRAMME COSTS (DC_e^{Ext})						
1. Physician Services (F.P./Specialist)	x				x	x
2. Laboratory and Xray Services (O.H.I.P./Private)	x		x		x	x
3. Institutional Care						
(a) Acute and Chronic Hospitals		x			x	x
(b) Nursing Homes/ Homes for the Aged		x		x	x	x
TOTAL EXTRA-PROGRAMME COSTS (TDC_e^{Ext})	x	x	x	x	x	x
II. INDIRECT COSTS (IC_e)						
1. Family/others lost work time					x	x
2. Family/others lost leisure time					x	x
3. Volunteer time						x
TOTAL INDIRECT COSTS (TIC_e)					x	x

TOTAL COSTS (TC_e) = $TDC_e^{Int} + TDC_e^{Ext} + TIC_e$

Table 4.2: Cost Components -- No Home Care Group

Note: x = Cost will be monitored

COSTS	VIEWPOINTS: GOVERNMENT: Ministry of Health O.H.I.P.	Ministry of Health Institutional Care	Ministry of Health Health Services	Ministry of Community and Social Service	Individual & Family	Comprehensive
I. DIRECT COSTS (DC_c)						
A. INTRA-PROGRAMME COSTS (DC_c^{int})						
1. Nursing (V.O.N., St Elizabeth's, P.H.N., Private)					x	x
2. Physiotherapy (Clinic, Private)	x	x			x	x
3. Speech Therapy(Clinic)		x			x	x
4. Homemaking (Private, Visiting Homemakers, Red Cross)				x	x	x
5. Social Work (Community Agencies)				x		x
6. Meals-on-Wheels(V.O.N., Macassa, Dundas)				x	x	x
7. Transportation (including ambulance)	x				x	x
8. Drugs			x			x
9. Sickroom Equipment					x	x
10. Medical Supplies					x	x
11. Friendly Visitors		x				x
TOTAL INTRA-PROGRAMME COSTS (TDC_c^{int})	x	x	x	x	x	x

...continued

Table 4.2: (continued) Cost Components -- No Home Care Group

COSTS	VIEWPOINTS: GOVERNMENT: Health O.H.I.P.	Health Inst. Care	Health Services	Comm. and Soc. Serv.	Ind. & Fam.	Comp.
I. DIRECT COSTS (cont'd)						
B. EXTRA-PROGRAMME COSTS (DC_c^{Ext})						
1. Physician Services (F.P./Specialist)	x				x	x
2. Laboratory and X-ray Services (O.H.I.P./ Private)	x				x	x
3. Institutional Care						
(a) Acute and Chronic Hospitals		x			x	x
(b) Nursing Homes/ Homes for the Aged		x		x	x	x
TOTAL EXTRA-PROGRAMME COSTS (TDC_c^{Ext})	x	x		x	x	x
II. INDIRECT COSTS (IC_c)						
1. Family/others lost work time					x	x
2. Family/others lost leisure time					x	x
3. Volunteer time						x
TOTAL INDIRECT COSTS (TIC_c)	x	x		x	x	x

$$TOTAL\ COSTS\ (TC_c) = TDC_c^{Int} + TDC_c^{Ext} + TIC_c$$

Measurement of Direct Intra-Programme Costs in the Home Care Group (DC_e^{Int})

Throughout this section, examples of current prices are shown. These are taken from the 1979-80 operating budget of the Hamilton-Wentworth Home Care programme [44] and are included for illustrative purposes only. When the analysis is done in 1980 and market prices are to be used for costing, then the prices available at that time (actual 1980 prices) will be used.

1. Nursing Services

Nursing services are purchased at a dollar rate per visit from the Victorian Order of Nurses (V.O.N.), the St. Elizabeth's Visiting Nurses or the Hamilton-Wentworth Regional Health Unit. In 1979-80, the V.O.N. rate is $13.61 per visit and the St. Elizabeth's rate is $13.50 per visit. These rates include costs to the agencies of administration, overhead and travel. Public Health nursing visits are charged to the programme at a rate of $15.00 per visit in 1979-80. This figure has been determined by the Deputy Minister of Health as the cost per visit for P.H.N. visits throughout the province, but it is unclear whether or not this price includes administration and travel costs. Because the P.H.N. nurses account for a small portion of the total nursing visits to Home Care patients (0.9% in 1978-79 among Chronic Home Care patients and 0.7% among all Home Care patients) and for ease of measurement, this "market price" will be used here and the assumption made that it reasonably estimates the administration, travel and nursing costs of the visit.

The assumption about the cost of P.H.N. visits will be challenged through sensitivity analysis. If, for example, the rate from the Home Care actual expenditures in 1980 were $15.00 per visit, the analysis would be re-done with rates of $14.00, $16.00 and $17.00. If the senstitivity analysis showed that this made a noticeable difference in the interpretation of the results, then a further estimate of the cost-per-visit would be made using the current budget of the Hamilton-Wentworth Regional Health Unit and allocating administrative and overhead costs and travel costs first among the various services the unit provides and secondly to the home visiting portion of the nursing service budget.

For each patient, the number of visits from each agency will be counted and the cost of nursing calculated by multiplying the number of visits by the dollar rate for 1980. Data collection methods for this and other utilization data will be discussed in Chapter 6 of the thesis. It is possible that nursing services may be purchased by the patient from other agencies in the private sector (for example, Comcare Ltd., Upjohn Ltd.) This is more likely to occur in the control group. If the Home Care patient does purchase these services privately, the market price will be assumed to reflect the cost and the cost will accrue to the patient's viewpoint.

2. Homemaking Services

Homemaking services from the two official agencies are also purchased by the Home Care programme at a dollar rate, and this will be used as the cost estimate for the study. In 1979-80, the rates

are $4.95 per hour for the Visiting Homemakers Association (V.H.A.) and $4.25 per hour for the Red Cross Homemakers (R.C.H.) These rates include the costs of administration and travel. Costs per patient will be obtained by multiplying the rate by the number of hours of service. Where homemaking is purchased from a private company, the market price will apply and the cost will accrue to the patient and family.

Homemaking is the only service that is limited under the Home Care programme. The maximum for the first month on Home Care is 80 hours per month and the maximum for the second and each subsequent month is 40 hours per month. Patients may supplement allowable homemaking with purchased services as above, or family and friends may perform homemaking functions. Donated family time will be estimated using using data collection techniques described in Chapter 6. These hours will not be costed in the first instance, but this will be challenged by sensitivity analysis using the wage rate for domestic workers reported by the National Department of Labour [8] and converted to 1980 dollars using the Consumer Price Index [108] or some other appropriate index. If homemaking services are purchased from a private company, but are within the hourly limit per month, the costs of these services are paid by the Home Care programme and would therefore accrue to the government. Where they exceed the monthly limit, the costs would accrue to the individual patient and his family.

3. Speech Therapy

Speech therapy costs are paid by the Home Care programme on the basis of an hourly rate and a mileage charge for travel. For each

patient in the Home Care programme who receives speech therapy, the average number of hours per visit will be multiplied by the number of visits and by the hourly rate. To this will be added the product of the average number of miles per visit and the number of visits and the rate of payment per mile to yield the total cost of speech therapy for that patient. The hourly rate of speech therapy, provided by therapists from Chedoke Hospitals, includes the costs of administration. The Home Care programme provides speech therapy in the home only while the patient is unable to get out. After that the costs accrue to the patient as in the control group. An example of the calculation is as follows: In 1979-80, the projected average number of hours per visit is 1.3, the projected average number ofvisits per patient is 9.2 and the travel per visit is expected to be 8.2 miles. At an hourly rate of $13.40 and a rate per mile of 21¢, the average cost per case is projected as:

$$(\$13.40 \times 1.3 \times 9.2) + (\$0.21 \times 9.2 \times 8.2) = \$176.11$$

4. Physiotherapy, Occupational Therapy and Social Work

These services are provided by the Home Care staff. In each case, the total salaries and fringe benefits will be divided by the number of visits to yield a cost per visit. For example, in 1979-80 it is expected that for $92,609.00 in salaries there will be 6,349 physiotherapy visits. This would yield a cost per visit of $10.96. There is a portion of the paid hours (1904 hours) not included in visiting, but this time is spent in patient related activities such as recording and should not be removed from the salary and fringe benefit total before the calculation is made. This cost per visit does not include

administration and overhead, but it should not since these will be counted later for the entire programme.

As with speech therapy, the costs per case for each of physiotherapy, occupational therapy and social work will be calculated in the following way:

Cost per Case =(Average miles per visit x number of visits x rate per mile) + (Cost per visit x number of visits)

Some Home Care patients will continue to have physiotherapy at a hospital clinic or in a private practiitoner's office. In these cases the programme pays for transportation if necessary (see below). The fee for physiotherapy is covered in the O.H.I.P. Schedule of Benefits [87] and will be costed accordingly based on the billing code. The cost of this service accrues to the Ministry of Health, unless the private practitioner charges a higher rate than the O.H.I.P. benefit, in which case the difference between the two will accrue to the individual viewpoint. Data collection methods for these data are described in Chapter 6.

5. Meals-on-Wheels

Meals-on-Wheels are purchased from one of three agencies in Hamilton-Wentworth. The programme does not always pay for this service, but does so if the purpose of having meals is to gradually decrease the use of a homemaker. In 1978-79, nine patients or 0.2% of the admissions to the total Home Care programme received meals with an average of 141 meals per patient. Of these, 8 were in the Chronic Home Care programme and represented 0.5% of the admissions in that programme. It seems from these data that few patients have this service paid for by the

programme, but those who do have it for a long period of time. The meals are served once a day for as few as one or as many as five days per week.

The price paid for the meals by the Home Care programme will be used to measure costs. In 1979-80, the price is $2.01 per meal from the V.O.N. or Macassa Lodge and $1.25 from Dundas Meals-on-Wheels. This "market price" does not include the cost of administration and overhead. All administrative and overhead costs will be summed and divided by the total number of meals served over the same time period in order to estimate the overhead and administration costs per meal.

For each patient, the price paid by the Home Care programme will be multiplied by the number of meals to give a cost per patient for the meals themselves. Similar calculations can be done for administration and overhead costs yielding a cost per patient for these. Each Meals-on-Wheels programme may be partially funded through government grants and partially funded through publicly donated money such as United Appeal funds. For example, the V.O.N. Meals-on-Wheels programme is currently funded by the Ministry of Community and Social Services, but by 1980 it is expected that it may be partially or completely funded by the United Appeal. For each programme, the proportion of funding from each source will be determined (for example, it may be 75% United Appeal funds and 25% government funds). The administration and overhead costs per patient will then be apportioned between the government and societal viewpoints in the same proportions. For example, in the case above, 25% of the costs would accrue to the government viewpoint, but 100% would accrue to the societal viewpoint (which includes the government viewpoint).

Some Home Care patients may purchase Meals-on-Wheels themselves and the cost to the individual viewpoint will be the price they pay (in 1980 prices) per meal. Administration and overhead costs will be calculated as above and allocated to viewpoints in the same way.

Volunteers are used by the programme to deliver meals. For each Meals-on-Wheels agency, the volunteer time per meal will be calculated by dividing the total number of volunteer hours by the number of meals delivered. For each patient, the number of meals will be multiplied by the number of volunteer hours per meal to yield a total number of volunteer hours per patient for Meals-on-Wheels. This figure will be multiplied by the Ontario minimum hourly wage [89] ($3.75 in 1979) to estimate the opportunity cost of benefits foregone through lost alternative uses of time. As with other volunteer time costs throughout the study, the costs will be included in the first instance at analysis, then excluded by way of sensitivity analysis.

6. Transportation

The costs of transportation of patients in the Home Care programme will be measured using the expenditures in the study year for this service. Patients may take the DARTS bus (Disabled and Aged Regional Transit System), taxi or public transit. Home Care will pay for the DARTS bus or taxi. Cost per trip will be calculated by dividing the total amount spent on transport in the year by the total number of trips. For each patient, the number of trips will be multiplied by the cost per trip to yield an overall transportation cost for that

patient. As with other services, the patient may pay his own transportation, in which the costs will be measured in the same way as for the control group (see below). Ambulance service is paid for by the Ontario Health Insurance Plan, and the government absorbs the usual $5.00 per patient fee for Home Care patients. This will be measured using the O.H.I.P. estimates of average rates per trip plus $5.00.

7. Drugs

Since all patients are over the age of 65, their prescription drugs are paid for by the Ontario government under the terms of the Drug Benefit Programme instituted in September 1974. For each patient, the drugs ordered by the physician will be priced according to the Ontario Drug Benefit Formulary [84]. This formulary is published annually, and lists prices of some 1600 preparations. The drug costs will accrue to the Ministry of Health.

8. Equipment

Equipment such as wheelchairs, beds, commodes, walkers, canes and crutches is supplied by the Home Care programme. Oxygen equipment is also included here (the gas itself is included under drugs). Some equipment is borrowed from the Red Cross Loan Cupboard rather than rented. Rental costs will be estimated by dividing the total costs of equipment rental to the Home Care programme by the total number of patients to yield a cost of rental per patient.

For equipment that is borrowed, the imputed cost will be calculated as a percentage of the rental costs per patient. For example,

if 10% of all equipment used for patient care by the programme is borrowed, then the cost of borrowing per patient will be 10% of the rental cost per patient. The administrative and overhead costs of running the loan cupboard will be obtained from the Red Cross and divided by the number of loans to yield an administrative and overhead cost per item loaned. This will be added to the overall cost of borrowing. Borrowing opportunity costs accrue to the comprehensive viewpoint.

Oxygen equipment rental will be treated separately and will be counted for those patients who have it at the monthly rate paid by the Home Care programme ($60.00 in 1979).

9. Medical Supplies

Medical supplies are obtained by the Home Care programme at a reduced rate and in bulk. For this area of cost there is no loan mechanism as in the case of equipment. Since costs associated with syringes, dressings and the like are usually associated with nursing visits, it is most appropriate to take this approach when measuring costs. The total amount spent on medical supplies will be divided by the total number of nursing visits in the same time period to yield a cost of medical supplies per nursing visit. This is the most direct approach that can be taken, since the nurses do not normally count supplies and it would be difficult to institute this practice. The cost of supplies per visit will be multiplied by the number of visits for each patient to yield a cost of supplies per patient.

Since the Home Care programme obtains supplies at a bulk rate, comparison with the control patients may reveal differences that are

related to price variation and not to resource utilization, moreover the resources used up may be exactly the same. Sensitivity analysis using first the reduced rate and second an estimate of the market price of the supplies per patient in Home Care will be done. In order to estimate the market price in the Home Care group, prices will be obtained from public medical supply houses for specific items such as syringes, dressings and solutions. These will be multiplied by the number of each type purchased by the Home Care programme and used. This new figure will represent the total cost of supplies at the market price and the costs per patient will be estimated as above.

10. Friendly Visitors

This is primarily a volunteer service administered by the V.O.N. and occupying space in the V.O.N. suite of offices. The programme has one paid coordinator who looks after most of the administrative tasks. Like the V.O.N. Meals-on-Wheels programme, this programme incurs costs of administration via the V.O.N. Director and other things such as space or rental of telephone. All administrative and overhead costs will be determined with the V.O.N. staff. The total of these costs will be divided by the number of volunteers who are carrying cases to yield a cost of administration and overhead per active volunteer. For each volunteer who is involved with a study patient, this cost will be divided by the number of cases with which the particular volunteer is working in order to determine an administrative and overhead cost per case. This cost will then be assigned to the comprehensive viewpoint

for each case with Friendly Visitor involvement.

The volunteer time per visit will be estimated in the following manner. For each volunteer involved with a study patient, the total number of hours for that volunteer will be divided by the number of cases yielding an estimate of the number of hours per case. This time will be costed using the Ontario minimum wage [89] multiplied by the number of hours. Since the volunteers act in the manner of friends to the patients and perform a variety of functions in a variety of time-frames, it can be argued that they are not foregoing anything in the sense of lost leisure time, and therefore the opportunity cost of their time is nil. In order to assess the significance to the overall analysis of costing the tiem of Friendly Visitors, sensitivity analysis will be performed with and without these costs, in keeping with the principles outlined earlier.

11. Administration and Overhead Costs of the Home Care Programme

Since the programme is primarily a coordinating one, the major costs of running it, apart from the purchased services, are contained in this component. Also, the administrative and overhead portions of the costs of physiotherapy, occupational therapy and social work services are contained here instead of in the costs per unit of service in the other areas such as nursing. The same holds true for the costs associated with equipment rental and the borrowing and purchase of medical supplies.

The Home Care programme provides service to both 'active' and 'chronic' patients, and therefore not all administrative and overhead

costs can be assigned to the Chronic programme which is of interest in this study. There are certain components of the administrative and overhead costs which are exclusive to the Chronic programme such as some of the office-based coordinators, some clerks and some offices and equipment. Other components are similarly exclusive to the Active programme and some are shared between the two programmes such as some clerks, the receptionist, certain offices and the assistant administrator. An organizational chart is available in Appendix D.

The first step in the allocation of these costs will be to go over the resources in detail with the administrator of the Home Care programme to identify those components which are shared and those which are exclusively used by the Chronic programme. Although this is done in the annual budget, the division for budget purposes may not accurately reflect current practice at the time of the study. The nature of the division changes with the nature of the Home Care case load and admissions. Once the division of Chronic, Active and Shared facilities and services has been accomplished, the cost measurement can commence. The exclusively Active components can be eliminated for the purpose of this study. Costs in each of the other categories will be measured as itemized below.

1. Personnel -- Annual salaries and fringe benefits will be used to measure costs for salaried staff. In the case of the Medical Advisor and the Auditor, reimbursement is in the form of an honorarium, which will be used to measure costs in these cases. Travel expenses excluding those incurred by home visiting in the case of occupational therapy,

physiotherapy and social work will be assigned to the costs of the personnel who incurred them according to the Home Care records. The District Director of the V.O.N., in her role as supervisor of all V.O.N. programmes, spends a portion of her time on Home Care matters. Costs will be assigned to this on the basis of the proportion of her time spent with Home Care and taking that portion of her salary and fringe benefits and counting this as the cost of her input. It will be assumed that secretarial and clerical time used by her apart from those provided by the Home Care programme are negligible.

2. Space -- The suite of offices occupied by the Home Care programme is rented from the Victorian Order of Nurses at an annual rent of $11,494.00 (1979-80). The V.O.N. rents the space in turn from St. Peter's Centre. In order to estimate the real resources used up by the space, the building costs to St. Peter's Centre will be reviewed to determine what costs what costs are included in and what costs are excluded from the rent. This will be done by determining what portions of hospital overhead costs are attributable to this space, notably plant operation and maintenance, laundry and linen, housekeeping and depreciation on the building and land (including interest foregone on the tied up capital). Although the Home Care programme budgets separately for heat, light, water and housekeeping, these expenditures may not reflect the total costs for these services to the Centre. After all costs have been determined, they will be compared to the rent paid by the V.O.N. and the Home Care programme in turn. It may be that the rent does not estimate the real costs of the space, particularly since a number of

the components usually included in rental rates such as heat, light and and water are purchased separately. In any event, the resource cost estimated through St. Peter's Centre will be used to estimate the cost of the space occupied by the programme. If this is less than the rent paid, then the rent is an added cost of the programme.

The cost of all space occupied by the V.O.N. will be noted and divided among its programmes according to square feet of space occupied by each. The overall area of the Home Care offices will be divided according to the divisions into rooms as they now exist. The total costs for the Home Care office space will be divided by the total number of square feet to yield a cost per square foot. This cost will then be applied to the various area square footages for the programme to yield a series of costs for all areas.

The hospital-based home care coordinators each have an office of some sort in their hospital location. At the time that the step-down costing procedure is done for measuring hospitalization costs (see Chapter 5) the cost per square foot of office space will be measured. The average square foot area of the hospital coordinators' offices will then be multiplied by this cost per square foot to estimate the opportunity cost of this donated space.

Distribution of space costs between the Active and Chronic programmes is discussed below under the heading 'Consolidation of Administrative and Overhead Costs'

3. <u>Equipment</u> -- New equipment purchased in any year is included at full purchase price on the operating expenditures of the Home Care

programme. For the purpose of this study, equipment with a life-expectancy of less than 5 years and purchased during the year of the study will be assessed in terms of whether or not it is for the use of the Chronic or Active programmes or both. The entire purchase price will be assigned accordingly as a cost. Equipment that had a purchase price of more than $100.00, has a life-expectancy of 5 years or more, and is not fully depreciated will be depreciated by allocating the the full price evenly over the number of years of life-expectancy and applying the annual depreciation as the cost for the study year. No salvage value will be assumed for this equipment, as suggested by the Canadian Hospital Association in their accounting manual [9]. Capital tied up in equipment will be calculated by totalling the original purchase price and applying an interest rate of 8%. This interest will be entered as a portion of depreciation costs and represents the opportunity cost of lost income from these funds.

4. Utility Services -- Expenditures for heat, light, water, cleaning, maintenance and housekeeping are itemized on the statement of operating expenditures and will be used here to measure these costs if the analysis of the costs of space to St. Peter's Centre reveals that these components are not included there. If used, the portion of these costs which are attributable to the Chronic programme will be determined by the amount of office space (in square feet) that can be attributed to functions related to the Chronic patients. If the review of space costs for the Centre reveals that these components are included in that estimate of real resources used up, then these expenditures will be excluded.

5. Administrative Expenses -- This category, labelled thus on the statement of operating expenditures, includes costs such as stationery, stamps, telephones, insurance, conferences , association membership fees paid by the programme, advertising and courier services. There are several ways of allocating these expenses between programmes such as floor space occupied, distribution of staff or percentage of the case load that is Active or Chronic. In this study, these costs will be allocated on the basis of the patient case load (in number of patient days) in each programme.

6. Consolidation of Administration and Overhead Costs

Once all costs have been measured, the totals allocated to each programme and the total shared costs will be determined. Costs of personnel will be assigned on the basis of proportion of time spent working with each programme. Costs of space and utility services will be determined on the basis of the number of square feet of space attributable to each programme or both. Equipment costs will be allocated on the basis of the use of each piece.

Total costs exclusive to the Active programme will be eliminated. Total costs attributable to the Chronic programme will be determined. Shared costs will be allocated between programmes based on the number of patient days in each programme over the same time period as the period in which costs were measured. The portion of these costs attributable to the Chronic programme and the total costs exclusive to administration and overhead for the Chronic Home Care programme can be summed. This sum will be divided by the total number of Chronic patients over the

same time period to yield a cost per patient. This can be added to the sum of all service costs for each patient to account for the costs of day-to-day operation of the Home Care programme.

Measurement of Direct Intra-Programme Costs in the No Home Care Group (DC_c^{Int})

This section outlines the direct intra-programme costs in the control group of the services which are parallel to the Home Care services and may be purchased in the community by the patient or provided by family and friends. In many cases, the market prices that are applicable to measuring costs for a particular service in the experimental group are also applicable in the control group.

1. Nursing Services

Nursing services will be costed as in the Home Care group, and the cost assigned to the viewpoint of the patient and his family except in the case of Public Health Nurses and those patients for whom a third party pays for nursing service (for example, private insurance or welfare services). Where the nursing service is performed by the Public Health Nurse, the cost will accrue to the Ontario Ministry of Health and where the service is paid for by a third party payer the cost will accrue to the comprehensive point of view.

2. Homemaking Services

Homemaking services will be costed in the same manner as in the

Home Care programme and the costs will accrue to the individual patient and his family. It is expected that the family members and/or friends in this group will provide more homemaking services than in the Home Care group. In keeping with the guiding principles regarding lost leisure time mentioned earlier, this time will not be costed in the first instance and then will be in sensitivity analysis. Time lost from employment will be costed throughout.

3. Speech Therapy

The hourly rate for speech therapy used to measure costs in the Home Care group will also be used in the control group. It will be assumed that the average number of hours per visit will be the same as in the Home Care group. The number of visits per patient will be determined from the records of the speech therapy departments of the Chedoke Hospitals and the Henderson General Hospital. The average number of miles travelled per visit from the patient's home to the out-patient speech therapy departments will be measured and costs assigned as described in the section on transportation below. The costs of the therapy per case will be determined by multiplying the average cost per hour by the number of hours per visit by the number of visits and assigned to the government point of view. Travel costs will accrue to the patient.

4. Physiotherapy

Physiotherapy is available through clinics or private practitioners to control group patients. Costs of the therapy will be measured using the O.H.I.P. Schedule of Benefits[87] and the billing code

for the particular procedure performed. Travel costs will be measured as outlined below.

5. Occupational Therapy

Occupational therapy is not available for the control patients.

6. Social Services

Services of social workers may be used by the control group patient or his family and may be obtained from the social afencies in existence in the community. For example, the patient may seek service from the Hamilton-Wentworth Family Service Association or similar organizations in the region. All agencies providing social service will be visited to determine their similarities in terms of caseload, including age mix, and administrative organization. One agency which is determined to be representative of those that deal with the elderly population will be used for cost measurement and these costs applied across agencies to patient data about the use of social work services. Where funding differs, this will be taken into account when assigning costs to viewpoints. Most social agencies are partially funded by government or societal viewpoints depending on how the funding is divided. Administrative costs per case wlll be measured by dividing the total expenditures for administration and overhead in the representative agency by the total case load for that year. The service costs per case will be determined by dividing the total salaries and fringe benefits in the social work group by the number of cases during the same time period.

The administration and overhead costs per case and the service costs per case will be combined to yield a total cost per case.

7. Meals-on-Wheels

Meals-on-Wheels per patient will be costed as in the Home Care programme and the cost of the meal paid by the patient will be assigned to the patient's point of view. Administration and overhead costs, if they are still separate from the rate per meal, will be assigned to the government or comprehensive viewpoint depending on the source of funds for the programme. Volunteer time will be costed in the same way as outlined for the Home Care programme.

8. Transportation

Patients may use a variety of forms of transportation in order to get themselves to facilities or they may not get out at all or very little because of lack of access to cheap and feasible transportation. Three modes of transportation will be considered as representative of the possible costs incurred: (1) taxi service, (2) special services for the aged and handicapped such as DARTS buses and (3) family or friends.

Several alternatives were considered in relation to measuring the distances travelled by patients in order to attend physicians' offices and outpatient clinics. One method might be measuring these distances for each patient, but this is impractical for some 400 patients given the amount of time involved and the relatively small part these costs are expected to play in the total cost picture.

Another method would be to do this measuring for a random sample of patients and use the mean values as representative of distances for all patients. Owing to the sequential way in which patients will be entered into the study this may still be impractical and the widely variant addresses expected would render the mean value too inaccurate. The method chosen is a variation which should allow for a smaller range of distances within which a particular patient's travel might fall and does not require actual measurement on the street or patient questioning. In relation to distance to physicians' offices, the address of the patient and the address of the physician will be found on a detailed street map of the region and the distance will be approximated using a ruler and the map scale. This distance will be recorded at the point of entry into into the study. Any specialists offices will be treated in the same way as referrals occur. These recorded distances will be kept on file for cost measurement. In relation to the distance between the patient's home and hospital clinics, a series of concentric circles will be drawn on a regional map around each hospital with radii increasing by a factor of 2 miles. Thus a series of zones will be created around each hospital with radial distances from the hospital of 2,4,6,8 miles and so on. The patient's addresss will then locate him in a zone in relation to each hospital and all patients within that zone will be said to travel a distance equal to the radius of the circle one way to the hospital. Thus, if Mr. Jones lives in Zone B (4 mile radius) in relation to Chedoke Hospital, then his round trip there and back will be 8 miles.

When the patient takes taxis, the mileage will be multiplied by the extant rate per mile for taxicabs and costs will accrue to the indivdiual viewpoint. Where private cars are used, the rate of expenditure per mile in the Home Care programme will be applied. In the case of friends' cars, these costs will accrue to the comprehensive viewpoint.

DARTS buses are available to patients for $0.40 per trip (1979) but the charge to agencies ranges from $5.00 to $6.00. In this case, the cost paid by the patient will accrue to the patient's viewpoint and the rest of the cost will accrue to the comprehensive viewpoint. The DARTS bus is municipally and publicly funded rather than provincially funded. Ambulance costs are paid by the Ontario government except for a $5.00 fee which , in the case of control patients, will accure to the individual patient and family point of view.

9. Drugs

Since all patients in both groups are over age 65, drug costs are paid by the Ontario Ministry of Health as described for the Home Care patients. The Ontario Drug Benefit Formulary prices will be used to approximate the costs of drugs [84].

10. Equipment and Supplies

Private agencies which rent equipment for use by patients in the home will be surveyed and a price list developed for these rentals. When a patient has rented equipment, these market prices will be used as an approximation of the cost which accrues to the patient point of view.

Since nursing visits generate the most use of medical supplies, it is expected that these costs will be minimal in the control group. Small and normal items for first-aid will not be counted. Where patients have purchased services from a nursing agency, the amount and type of medical supplies used will be estimated from the Home Care data as described earlier to yield an amount and type of supplies per visit. Market prices for different categories will then be applied to this data based on a survey of retail outlets. The costs per visit will be multiplied by the number of nursing visits to yield a cost of medical supplies for a particular patient. Where the patient has purchased some supplies homself, these costs will be reflected in the individual and family point of view.

11. Friendly Visitors

Control patients may use this service through self-referral or other referral and the cost measurement per case will be the same as in the Home Care group. There is no cost to the patient for this service. Friendly Visitors are volunteers who act as friends in a variety of ways for otherwise isolated individuals in the community. Supplementation by natural friends is likely to cocur in both groups, and will be noted in the social function questionnaire. In keeping with the notion of revealed preferences, this time will not be counted. It is expected that the randomization process will balance between groups the number of isolated patients versus the number with a large group of friends.

CHAPTER 5

COST MEASUREMENT II: EXTRA-PROGRAMME AND INDIRECT MEASURES

In this chapter, approaches to measuring direct extra-programme costs which include physician's services, laboratory and x-ray services and institutional services are described. The step-down approach to hospital costing will be described and the method for defining acute, chronic and rehabilitation hospital days will be outlined. Approaches to the measurement of indirect costs will be discussed.

Direct Extra-Programme Costs ($QC^{Ext}_{e \text{ or } c}$)

1. Physician's Services

Data collection techniques for physician utilization and all other health service utilizations will be discussed in Chapter 6. The cost of all billable procedures listed for any one patient will be measured using the O.H.I.P. Schedule of Benefits[87] for 1980. Where a physician has opted out of O.H.I.P., the portion that O.H.I.P. pays for his service will be assigned to the government viewpoint as with the opted in physician. The extra portion charged to the patient will accrue to the individual viewpoint. Although not all such physicians will charge these particular patients a higher fee, and not all will charge the fee recommended by the Ontario Medical Association (some

will charge more, some will charge less), this O.M.A. suggested fee for 1980 will be used to approximate these extra costs of physician care. It is assumed here that those who charge more than the O.M.A. fee and those who charge less will balance out. The potential loss of data due to physician or patient refusal to reveal the actual fee prohibits any attempt here to measure the fees charged each patient.

2. Laboratory and X-ray Services

Costs of laboratory tests ordered and x-rays completed will be measured using the O.H.I.P. Schedule of Benefits for 1980, including benefits for preparation of films and test materials as well as professional fees for interpretation. Where the participation in this service involves travel for patients, the transportation will be measured as described above and the costs included in this category. Care will be taken to ensure that these trips are not counted twice in the course of data collection. Where a radiologist is consulted in the interpretation of x-rays, the cost of his service will be measured using the O.H.I.P. Schedule of Benefits as well.

3. Institutional Service Costs

In addition to the development of cost measurement strategies for all types of institutionalizations of interest to this study, this section will include a description of the methods for determining whether or not a hospital day can be classified as acute, chronic or rehabilitation in relation to the type of care received.

(i) Costs of Nursing Homes, Homes for the Aged and Retirement Homes

The costs of nursing homes, retirement homes and homes for the aged will be costed using the daily rate as an estimate of the costs involved. This market price is believed to reflect the resources used up with reasonable accuracy, particularly because of the homogeneous nature of the patient populations within these institutions. Nursing homes are residential facilities owned and operated by individuals or corporate entrepreneurs. The patient pays about one third of the daily rate and the Ministry of Health pays the rest if the patient requires at least 1.5 hours of nursing care per day [85]. The nursing homes in the area (some 25 in number) will be canvassed for their daily rate and an average calculated. This average daily rate will then be applied to the number of nursing home days in the patients where it is applicable. Homes for the aged are residential retirement homes supervised by the Ministry of Community and Social Services. Patients usually pay a portion of the daily rate as in the nursing home situation. Retirement homes are privately or corporately owned residential homes, where the entire daily rate is paid by the patient.

(ii) Hospitalization Costs

The problem of accurately measuring costs in hospital has been mentioned earlier in this thesis. Basically, the argument is that the daily rate or per diem rate often used will over-estimate the actual cost per day of care for most patients. This is because the daily rate is merely a sum of all expenditures divided by the number of patient

days, and includes costs for activities other than patient care such as educational and research programmes and certain services not related to the type of patient under study. As mentioned earlier, the per diem rate was at one time a budget allocation device, but it is no longer used for this purpose in Ontario with the advent of global budgets. In the United States, where patients are often billed for hospital care directly and itemized accounts are necessary for insurers, the systems of hospital accounting are developed in such a way as to make itemized estimates of care for one type of patient for one day or for one episode of care more available.

Given that the goal is to measure the hospital use profile as accurately as possible for any particular type of patient, two specific costing methods were considered. The first is to take some sort of sample, preferably random, of patients with the conditions of interest and observe their total experience in hospital over time. Summary data from this observational sample survey would enable the researcher to develop a profile of care for the type of patient in question. Then costs can be measured for each component ingredient of the care profile and they can be summed to yield a cost per patient episode. This approach was used in part by Gerson in his study of Home Care for active patients in Newfoundland [36]. Using a scheme for determining levels of care in nursing units developed by MacDonnell and Murray [73], he was able to assign 'point' scores to patients of various types for the purpose of costing the care given based on an average cost per point of nursing care which he devised. The costs of administration and overhead were allocated according to budget allocations in Gerson's study.

The ingredients approach described above can provide a reasonably accurate picture of resources used by different types of patients for different lengths of time, and can be extended to include many of the administration and overhead departments by looking at the input of these departments in relation to the patients being observed. It is obvious that the method can be time-consuming and might be quite expensive in terms of both human and computer resources.

The step-down approach arises out of hospital accounting procedures and starts from the point of the hospital's ledgers and records of expenditures, then works down through these records with input from various personnel along the way. It also can be time consuming and requires a certain understanding of accounting procedures and facility with large lists of figures. It has one notable advantage over the ingredients approach in that once it is done for an institution it can be applied to a variety of patient types and episodes with a little modification each time. Thus the overall allocation procedure does not need to be begun anew each time the researchers are interested in a different group of patients.

The step-down cost allocation method for cost analysis has been recommended by both the American Hospital Association and the Canadian Hospital Association for their members [3,10,100]. The basic principle behind the approach is that aggregate hospital expenditures are allocated to support and service centres in such a way as to eventually parcel out reasonable accurate estimates of costs attributable to specific patient service outputs. Some examples of the patient service outputs

that might be considered could be one day of chronic care, a pediatric surgery episode from admission to discharge or a particular procedure such as an appendectomy. The method not only allows allocation of costs not directly assigned to service outputs, but also allows the exclusion of certain costs which may not be directly related to patient service. For example, at the Chedoke Hospitals in Hamilton, where this study will be carried out, there are a number of rented premises whose services do not relate to in-patient treatment. Educational and research departments constitute other non-service related areas.

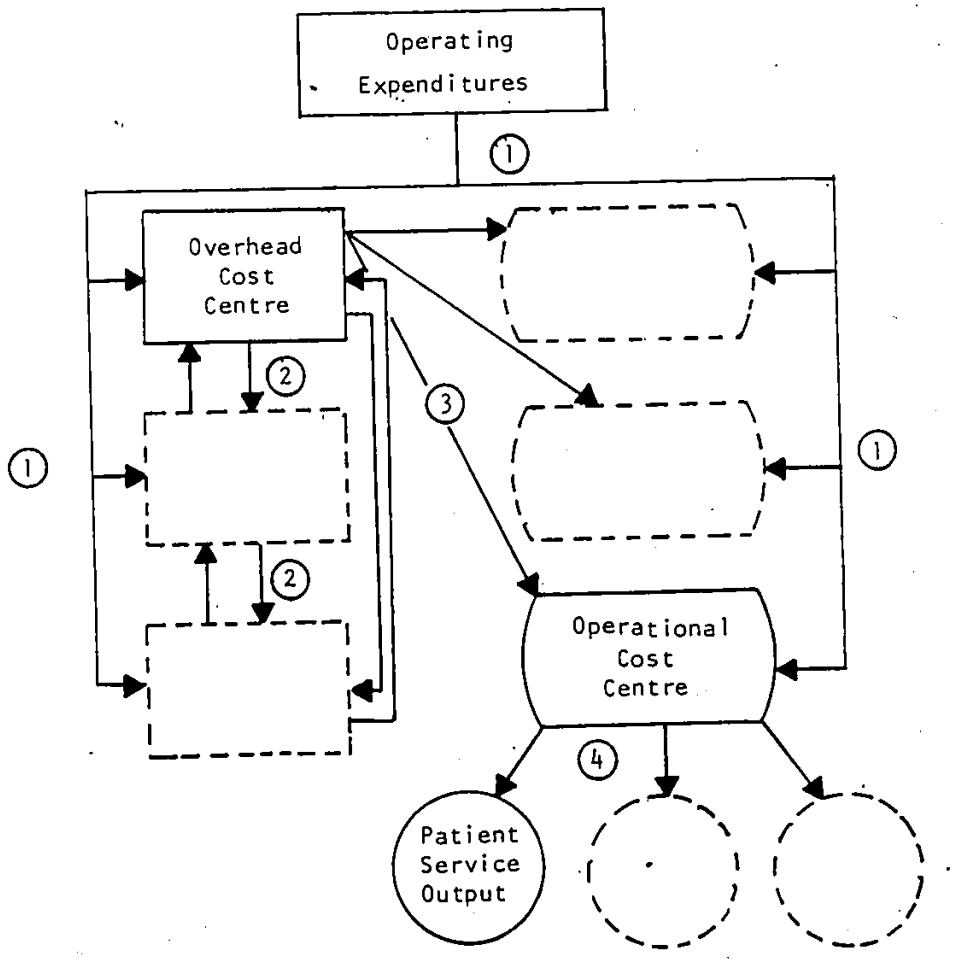
In order to understand the model, some definitions of terms would be helpful. Cost centres can be defined as the units of the hospital for which costs are accumulated [10], or centres of operation or activity. Evans and Robinson [30] then divide these into operational areas and overhead areas based on the definition that the overhead areas provide services to the others but do not provide direct service to patients. The Canadian Hospital Association call the overhead areas supportive and administrative areas with the same rationale as Evans and Robinson. In the United States, where hospitals are private enterprises, these are often called non-revenue departments and the operational areas are called revenue departments [3]. For the purpose of this study, all cost centres will be defined by function (for example, active nursing unit, surgical suite, housekeeping) and the definitions of Evans and Robinson for operational and overhead and administration centres will be used to determine the differences between the two types.

The step-down method of cost allocation then, attempts to distribute all costs of overhead departments and administration among

operational areas so that the cost of services provided by the overhead departments is distributed to them. At the same time, cost centres which are operational but unrelated to the service outputs of interest can be separated from those that are of interest. For example, after allocation the costs associated with pediatric care can be considered separately from the costs of geriatric care if the output of interest is a day of in-patient pediatric care. After the allocation procedure is complete, the pediatric nursing unit would have a fully allocated cost attached to it, which can be further reduced to cost per patient day (an average fully allocated cost). As the procedure is carried out, the overhead departments have all expenditures allocated to other cost centres and the department is 'closed down'. The resultant accounting work-sheet looks like a series of stairs as successive departments are closed, hence the name step-down costing. The process is illustrated by diagram in Figure 5.1 (including the multiple apportionment approach which will be used in this study).

Berman and Weeks [3] describe three currently used variations of the step-down cost-allocation method. In the simplest version, costs of the largest overhead department are allocated first on the basis of some agreed upon allocation scheme (for example, pounds of laundry or square feet of physical plant). Then this department is closed down and the procedure is repeated with the next largest department and so on. One disadvantage here is that it does not completely allow allocation <u>among</u> overhead departments. The largest department, for example, has no cost allocations from other departments.

Figure 5.1: The Process of Step-Down Allocation with Multiple Apportionment



Note: Sequence of Cost Allocation

1. Budget Allocation to Cost Centres
2. Allocation Between Overhead Centres
3. Allocation to Operational Centres
4. Allocation to Patient Service Outputs

The double apportionment method allows for more of this between overhead department allocation. In this approach, the costs of each overhead department are first allocated among all others and all operating departments based on allocation schemes as described above. A second apportionment then is done with these allocated figures from the overhead departments to the operating departments thus closing down the overhead departments. This method is a more equitable distribution of overhead costs and is recommended again by both hospital associations as the one of choice. The Canadian Hospital Association recommends three apportionments along these lines.

The third approach is the one that will be used here and is called the multiple apportionment or algebraic type. A series of multiple and simultaneous apportionments allow the most accurate estimate of the true interchange of costs between overhead departments. The method used here was developed by Evans and Robinson [30] in analysing the Day Care Surgery service at the Vancouver Children's Hospital and consists of developing a series of simultaneous equations for closing out overhead departments and a series of allocation protocols for distributing costs among operating departments.

After costs are allocated to various cost centres, they can then be summarized in a variety of ways depending on what the purpose is for measuring costs. For example, in this study we are interested in the costs per patient day in a chronic bed or an acute bed. In other studies, one might be interested in the costs per episode of care for a particular group of patients within a diagnostic category or in the costs per nursing unit per day of operation. The costs are expressed as

average fully allocated cost perunit of patient service output.

If the allocation procedure to this point has resulted in costs fully allocated to the level of an acute or chronic nursing unit, then it may be reduced to an average fully allocated cost per patient day on that unit in a number of ways. For example, the costs could then be apportioned between diagnostic categories or type of accomodation (semi-private, private, ward) and costs developed for a day of care with ward accomodation for treatment of rheumatoid arthritis. Another way of weighting the allocation at this point might be in relation to whether or not the unit is functioning at capacity. Since the overhead allocations are the same on the unit or would change only slightly, then as the case load fluctuates, the average fully allocated cost will fluctuate inversely. If the case load rises, then, the average fully allocated cost will decrease because there are now more patients (and patient service units) among which to distribute the overhead and administration costs.

Illustration of the Step-Down Method

Patients in the study can be expected to be admitted to any of the six regional hospitals* and may be admitted outside the region. It is unrealistic to apply the step-down costing procedure to all of these hospitals for two main reasons. First of all, it is a complex and time-consuming procedure that will take a large part of study staff time.

*St. Joseph's Hospital, Hamilton General Hospital, Henderson General Hospital, McMaster University Medical Centre, Chedoke Hospitals, St. Peter's Centre

Secondly, regional bargaining, which accounts for standardization of salaries (70% of budget expenditures) and regional planning make the hospitals more or less comparable. Before and after the procedure is completed the diagnostic mix and service mix of each hospital will be compared to those of the study hospital to ensure that there are similarities within the chronic, rehabilitation or acute care areas.

The study hospital will be Chedoke Hospitals, which provide a variety of in-patient and out-patient services to the community. This hospital was chosen for several reasons. First of all, it contains a chronic hospital, an acute hospital and a rehabilitation hospital so that the costs for each category can be developed at one time. Secondly, the Chedoke administration is research oriented and willing to allow researchers to examine their operation, a qualifier that is very important in the real-world application of research techniques. Thirdly, there are several researchers in the region with projects in which they want to develop fully allocated costs and this group have been discussing the step-down procedure with the Chedoke administration. As a result, the hospital will hire a research associate in the fall of 1979 to develop the allocation schedules and begin the measurement of costs within several categories including acute, chronic and rehabilitation hospital days.

It is important to challenge the assumption that the costs will be the same or similar across hospitals, and this will be done through sensitivity analysis, and the comparison of hospital beds, diagnostic and service mix described above. Several alternatives for varying

costs are possible. The costs could be varied according to some arbitrarily chosen percentage above and below the cost estimates from Chedoke. This would tell something about the effect of higher or lower hospital costs on the outcome of the study, but little about how these relate to variations in hospital costs. A different approach to costing the service component of hospital costs could be used, such as observing levels of nursing care given and itemizing other services, but this would be time-consuming and expensive. In this study, the hospital costs comparability across facilities will be challenged in the following way. In sensitivity analysis, the admissions to institutions other than Chedoke will have their average fully allocated costs increased or decreased by a factor equivalent to the differences between the per diem rates in the various institutions. For example, in 1977-78 [86] the per diem rate at Chedoke was $179.47 while the per diem at St Joseph's Hospital was $165.24. Analysis which accounts for these apparent differences will indicate whether or not altering the hospital costs component has any effect on the overall cost-effectiveness results. During this procedure, the admissions to McMaster University Medical Centre will not be adj ted, since the per diem at this hospital ($341.66 in 1977-78) most likely differs because of a large teaching and specialized service component. All units will be assumed to be functioning at capacity.

The first step in the process is to describe the hospital and obtain financial statements of operating expenditures, which are used as the basis of cost estimation. The Chedoke Hospitals consist of 31 buildings including a general hospital, a rehabilitation Hospital, a

chronic hospital and a regional children's centre. A number of buildings are leased to related health agencies such as the Alcoholism Research Foundation and the Health Sciences campus of Mohawk College. In addition, buildings are rented for staff and other professional offices and clinics.

For this study, the allocation schemes for distributing costs will be developed in 1979-80 with the current statement of operating expenditures and survey of the service and case mix of the hospitals. Prior to this analysis, the service and case mix will be reviewed to ensure that the allocation schedules are still applicable. If not, new ones will be devised where necessary. The base year for the study will be 1980, and the 1980-81 statement of expenditures will be used if available. If it is not available, the 1979-80 prices will be indexed to 1980-81, using the Consumer Price Index [108]. For the purposes of this illustration, the statements for the fiscal period of 1977-78 (15 months) will be used.

The second step in the process is to separate out the overhead departments from the operational areas (that is, those providing services directly to patients). Evans and Robinson [30] have developed a series of equations for their study which are solved simultaneously to allocate costs among overhead departments. This is the part of the multiple apportionment method that differs from other step-down methods and which attempts to account for all services provided between overhead departments. The reader is referred back to Figure 5.1 for a graphic display of the technique. These apportionments are done with

a series of algebraic equations which are solved at the same time. A sample of three such equations for three overhead departments is worked through below with hypothetical coefficients for the interchange of costs. In the actual step-down process these coefficients are somewhat arbitrary and are based on a review with administrators of the portion of goods and services within each department that is used by others.

For illustration, then, using the 1977-78 statements from Chedoke, the following are the expenditures for certain overhead departments:

Plant Overhead (PO)	-	$ 2,624,973
Laundry and Linen (LL)	-	$ 538,592
Housekeeping (HK)	-	$ 1,212,367
Dietetics (D)	-	$ 1,448,391
Employee Benefits (EB)	-	$ 2,383,154.35
Transport (T)	-	$ 241,657

Suppose, then, that 3% of Employee Benefits costs pertain to Plant Overhead and 5% pertain to Housekeeping, 2% of Plant Overhead costs pertain to Employee Benefits (Lunch Rooms and Locker Rooms) and 1% pertain to Housekeeping, while 2% of Housekeeping pertains to Employee Benefits. These distributions can be developed for all overhead departments and the resultant equations solved simultaneously. For illustration here, these three departments will be considered.

The equations of costs are:

(1) PO = 2,624,973 + .03EB + .03 HK (27)

(2) HK = 1,212,367 + .05EB (28)

(3) EB = 2,383,154.35 + .02 HK + .02 PO (29)

The equations can be solved by substitution:

(i) Substituting (2) into (1) (30)

PO = 2,624,973 + .03 EB + .03(1,212,367 + .05EB)

= 2,624,973 + .03 EB + 36,371.01 + .0015 EB

= 2,661,344.01 + .0315 EB

(ii) Substituting (2) and (i) into (3) (31)

EB = 2,383,154.35 + .02(1,212,367 + .05EB) + .02(2,661,344.01 + .0315 EB)

= 2,383,154.35 + 24,247.34 + .001 EB + 53,226.88 + .0063EB

= 2,460,628.57 + .00163 EB

= <u>2,464,645.94</u>

(iii) Substituting (ii) into (2) (32)

HK = 1,212,367 + .05(2,464,645.94)

= <u>1,335,599,30</u>

(iv) Substituting (ii) into (i) (33)

PO = 2,661,344.01 + .0315(2,464,645.94)

= <u>2,738,980.36</u>

Once all equations of this sort in relation to overhead departments have been solved, the overhead costs will be allocated among overhead departments.

The next step is the allocation of the overhead costs to the operational units in the hospital. This will be done using an allocation schema based on the units of volume of interest in each overhead department. For example, the laundry and linen costs will be distributed among operational and rented departments on the basis of poundages outgoing to each department. The Plant Overhead expenses will be allocated according to the floor space in square feet occupied by each department. These bases for allocation of overhead costs are listed in Allocation Schedule A - (Table 5.1).

Certain other expenses are not part of the simultaneous stepping down of the overhead departments but must still be allocated across operational areas. Examples of these are medical supplies and drugs. Allocation schedules for these costs will be developed based on the percentages of the total resources for supplies or drugs used by a particular operational area. For example, the 1977-78 expenditures for drugs were $228,887. If 40% of these were used by the acute hospital, then $91,554.80 are allocated to the acute care hospital. Laboratory and x-ray services are allocated in the same way.

Administration costs are allocated at the end of the process and will be allocated according to the percentage of total other costs centred in any single operational unit [30]. This is somewhat arbitrary, but seems more reflective of the real costs than a mere allocation by percent of square feet of building or total administrative salaries. Salaries and wages are allocated on the basis of the number and type of employees in each department.

Table 5.1: Allocation Schedule A
Bases for Allocation of Overhead Costs

Department	Allocation Basis
1. Plant Overhead	Square feet of space occupied excluding corridors and stairs
2. Laundry and Linen	Pounds used per department
3. Housekeeping	Square feet of floor area covered
4. Dietetics	Number of meals served per department including staff
5. Employee Benefits	Salaries and wages per department
6. Transport	Miles reimbursed per department includes staff and administration
7. Equipment Depreciation	Distributed fixed assets by department

Once the step-down process is complete and all costs allocated to operational cost centres, cost centres of no interest can be 'closed', and the result at this point is a fully allocated cost to the cost centres of interest. In this study these are acute, chronic and rehabilitation units. The average fully allocated cost per day in each type of care can be calculated. First, however, these days of care must be defined for patients in this study.

Acute , Chronic and Rehabilitation Days

Each patient in the present study will generate data regarding hospitalization if applicable. One way to assign costs is to refer to the concept of episodes of care for a particular diagnosis or category within a diagnosis. For example, one might talk about the episode of care for myocardial infarction or for chronic ischemic heart disease regulation. In each case, data can be collected about the usual clinical course and treatments used. Treating this as an episode of care, then, costs can be derived based on average fully allocated costs per in-patient or out-patient day, and per service provided.

In this study, since the randomized trial which will generate some of the data that would be used to define an episode of care is concurrent with the economic evaluation and since there will be actual data which is patient specific for both 'states of the world', it has been decided to measure hospitalization costs based on average fully allocated costs per day of care in an acute or chronic bed. Data will also be available at the time of analysis to describe the average episode within each of the functional categories (acute or chronic) and within each of the diagnostic categories.

Hospitalization for patients in this study might be because of (a) an acute episode in their chronic illness(es), (b) an episode of admission for regulation or maintenance of their chronic illness(es) or (c) some other disease unrelated to their chronic illness(es) and unrelated to the fact that they are on Home Care. All admissions will

be reviewed on the basis of admitting and discharge diagnosis and separated into acute, chronic and rehabilitation categories on the following bases:

1. All admissions to chronic hospital (St. Peter's Centre) or chronic wards in an acute care hospital will be designated as chronic.

2. All admissions to rehabilitation hospital (St. Peter's Centre or Chedoke Hospitals) will be designated rehabilitation.

3. If patients move from one designated area to another within or between hospitals during the course of their hospitalization the number of days spent in each type of facility will be counted as that type of bed days. For example, if Mr. Jones is admitted to the chronic hospital at Chedoke for two weeks and then transferred to the rehabilitation hospital for 3 weeks, his hospitalization days will be 14 on chronic care and 21 on rehabilitation care.

4. Admissions for diagnoses other than the chronic ones will be designated acute, and these costs will be compared separately between Home Care and control groups.

5. Admissions for surgery, extensive diagnostic work-up or intensive care will be designated as acute. Again, if the patient is transferred to another form of care during hospitalization, this will be reflected in the type of care days assigned.

6. The range of admitting and discharge diagnoses in each category of chronic illness (see entry criteria for study) will be reviewed with the Medical Advisor to the Home Care programme in order to classify them as acute, chronic or rehabilitation if they have not been classified already as above.

The classification of the types of care days developed is in Table 5.2:

Table 5.2: Primary and Secondary Comparisons in Classification of Patient Care Days

		Type of Day		
		Acute	Chronic	Rehabilitation
Relation to Diagnosis of Study Interest	Related	Primary Comparisons		
	Unrelated	Secondary Comparisons		

Final Allocation of Nursing Unit Costs

It is expected that the result of the step-down procedure to this point will be fully allocated costs for short-term treatment units (which is equal to acute treatment in the terminology used here) and for long-term treatment units (which equals both rehabilitation and chronic beds). The long-term costs will be further allocated in the following way. First, all costs other than salaries and wages will be allocated to either rehabilitation or chronic areas on the basis of square footage of space occupied. Salaries and wages will be allocated on the basis of the numbers and types of employees in each area. At the end of the allocation, costs will be allocated to each ward of each type by dividing the costs for that type of service by a factor

which reflects the bed capacity of the wards. For example, if there are three chronic treatment wards with 20,30,and 50 beds each, then the costs will be apportioned to these wards in the order of 20%, 30% and 50% respectively.

For the purposes of this study, costs will be developed for a day of care of each of the three types by a simple method of dividing operational costs for the nursing unit or ward by the number of patient days for the budgetary period, by similarly dividing the overhead costs and summing the two. The result is an average fully allocated cost per patient day on acute, chronic or rehabilitation care. At the time of analysis, the number of patient days for the study year will be examined. If there is a noticeable increase or decrease in this figure, the average fully allocated cost will be re-calculated using this figure, since it would be expected to change as the number of patient days changes. The average fully allocated cost will not be weighted by other factors such as age group or diagnosis, since this would represent a major extra input from study staff with little expected impact on the overall results of the study. This is especially true given the variety of possible admission and discharge diagnoses and the similarity in chronic diseases in terms of the level of care needed. The number and type of days in hospital per patient will be multiplied by the appropriate average fully allocated cost to yield a cost of hospitalization per patient.

Costs of Geriatric Day Care

Since either Home Care patients or control patients could be participating in geriatric day care at one of several institutions, these costs must also be measured. There is a Geriatric Day Care programme at

Chedoke, and this programme will be treated as an operational cost centre and an average fully allocated cost will be developed for a day of care. This cost will be assumed to reflect resource use in all geriatric day care centres in the region, unless their is marked difference in the programmes. Where the programmes are markedly different than the one at Chedoke, overall operating expenditures for the programme will be determined by budget review and a cost per day of care developed by dividing these by the number of patient days over the same time period.

Costs of Emergency Room Visits

Since hospitals calculate an average cost per emergency room visit for budgetary purposes, these will be surveyed in the three most active emergency rooms (Henderson, Hamilton General, St. Joseph's) and the mean value of the three will be applied as the cost of an emergency room visit for study patients.

Indirect Costs ($IC_{e \text{ or } c}$)

Indirect costs represent the loss to society (usually of productivity) because of participation in the programme. This can be translated to the time taken to attend clinics in the control group (in lieu of home-based service) or to receive care at home for experimental patients. It may also be time lost by family members or friends in order to transport patients to service or provide service in the case of control patients.

In relation to employed people who take time from work to

transport patients or care for them, this data will be collected at interview and the average annual salaries or wage rates (hourly) for the type of work usually performed by those persons will be applied to estimate the productivity lost.

Patients in this programme, along with many of their family and friends, are expected to be retired and therefore donating leisure time rather than productive time. The principles in relation to leisure time stated earlier (Chapter 4) will hold. Donated time of family and friends will be estimated from interview, but will not be costed in the first instance. Patient lost time will be costed at the rate of the Ontario Minimum Wage.

CHAPTER 6

COLLECTION OF RESOURCE UTILIZATION DATA

A large portion of the cost measurement for this study will be dependent on accurate data about all health service utilizations in a variety of sectors of the system, plus utilization of the resources of family and friends in order to participate in health programmes. Particularly, the use of community resources in the control group will have to be monitored closely. This chapter will detail the strategies for data collection in relation to these and the rationale for the strategies chosen.

Overview of Resource Utilization Variables

It is apparent from Chapters 4 and 5 that there are a number of variables that must be described in order to measure the costs to all constituencies in both programmes. In the area of direct intra-programme costs, data must be collected about the number and type of services used by any one patient from a variety of community agencies, as well as information about transport to some services. In the same cost category, there must be data about drug use, and use of medical supplies and sick room equipment. In relation to direct extra-programme costs, data will be collected about all

physician services, laboratory and x-ray services, and institutional utilization. Again there may be transport costs related to obtaining services. In the indirect cost category, time used to obtain services must be counted. In Table 6.1, the categories of resource utilizations are listed along with the related variables for each and an indicator of what is the associated cost calculation. Data collection instruments for all resource utilization data are illustrated in Appendix F.

Methodologic Issues in Data Collection

Several alternatives have been considered in relation to data collection for this large set of variables. Since the effectiveness measures for the concurrent randomized trial are to be taken by questionnaire at personal interview, it would be convenient if utilization measures could be taken at the same time. Several problems arise in this alternative. The first one is in relation to the nature of the study population, which is made up of persons who are elderly and chronically ill. It is expected that they may have problems with recall for past events and the information they give may not be accurate. Particularly in relation to the number of times they received a particular service (rather than whether or not they received it at all), they may have difficulty remembering details. Cannell and his colleagues at the University of Michigan Institute of Research [12] showed that the maximum reliable recall period for physician services is 14 days and the longest for any service is 183 days for hospitalization.

Table 6.1: Resource Utilization Variables

Cost Component	Variables	Collection Methods
Hospital	Name of Hospital For each ward: Length of Stay Acute/Chronic/Rehab. Diagnosis(es) [Surgical/Diagnostic Procedures] Death (if applicable) Emergency Visits Day Care Days	Record Abstraction O.H.I.P. Patient Interview Family Interview
Nursing Homes Homes for the Aged Retirement Homes	Name of Institution Length of Stay Private/Semi-Private/Ward Day Care Days	Telephone Interview Family Information Record Review
Physician's Services	Office Visits -- Billing Codes Referrals Opted In/Opted Out [Surgical/Diagnostic Procedures] *Institutionalization	Daysheets Record Review

...continued

Table 6.1 (cont'd): Resource Utilization Variables

Cost Component	Variables	Collection Methods
Community Agency Services: Visiting Nursing Physiotherapy Occupational Therapy Speech Therapy Homemaking Meals-on-Wheels Friendly Visitors	Name of Agency Visits/Week or Hours/Week Change in Frequency of Service Home/Clinic Miles/Visit (Average) Hours/Visit (Average)	Telephone Survey Record Review Patient Interview Family Interview
Laboratory	Name of Test	Physician's Records
X-Ray	Name of X-Ray	Physician's Records
Medical Supplies	Visiting Nursing? Yes/No Dressings Solutions Syringes Other	Family Interview Patient Interview

...continued

Table 6.1 (cont'd) Resource Utilization Variables

Cost Component	Variable	Collection Methods
Sick-Room Equipment	Rental Yes/No Loan Yes/No Agency (if rented) Walker, Cane Bed, Commode Crutches, Lifting Devices Wheelchair, Bathroom Aides Other	Patient Interview Physician's Records Nursing Records Home Care Records Family Interview
Transportation	Destination Distance Mode of Transport Time	Patient Interview Demographic Data (Patient Specific) Maps Family Interview
Family Helpers Patient	Time	Patient Interview Family Interview

[ ] While surgical/diagnostic procedures incur hospital and physician costs, the data will be collected in the hospital record abstraction because this is most likely to reveal the billable procedure terminology.

* Hospitalization in physician's records will serve as a flag for hospital record search.

Since Cannell's study was carried out with a general population of all ages, it is likely that the patients in this study will have even less reliable recall. If questions about utilization were included in the interviews for effectiveness outcomes, then these data would be collected at 3 and 12 months after entry into the study, and estimates for utilization over the entire period would have to be made based on the 2 weeks before each of the interviews. Given the importance of the utilization data for a variety of cost measurements and the guiding principle that costs for each individual patient will be measured as accurately as possible, this alternative is not feasible.

One way to attempt to handle the recall problem would be to interview a random sample of the study groups at two week intervals and estimate utilization for the preceding two weeks from the data from these samples. These would have to be face-to-face interviews with a group of elderly patients because some may be too feeble to return or accurately complete a mailed questionnaire and too hard of hearing to answer a telephone interview. This approach would still result in estimation for much of the utilization data for each individual patient. With such a large number of samplings through the study group, there could be a problem of fatigue with the interview if a number of patients are randomly selected 2 or more times. The cost to the study staff in time for the interviews and coding the data, plus the cost of analyzing these data sets would most likely be prohibitive. Since the study is part of an overall evaluation of the programme, involving three lengthy interviews with 400 patients over the period of the study, this added expense might tip the study over the

'fundable' limit. There are portions of the data which are not obtainable from the patient such as admission and discharge diagnoses and the names of billable procedures from physician visits. Thus, it would be necessary to go to other sources than the patient in order to gather some parts of the data base and to confirm others.

As a result of these considerations and in order to meet the goal of obtaining as much patient-specific data as possible for cost-measurement, an alternative group of data collection techniques have been developed for this study. Data will be collected in a variety of ways from patients directly, through chart abstraction in hospital and daysheets in physician's offices, as well as telephone and chart information from community agencies.

Comparability of Data

An important issue in a study such as this, where a large number of variables are being measured in the community, is that all data be collected in the same way in both experimental and control groups wherever possible. With the Home Care group, the programme's records would readily provide most of the data needed about intra-programme variables. However, this could introduce a systematic difference or bias into the data because of unknown and unpredictable differences in the quality of the data between groups. It may be that the community acquired data is less complete than the Home Care records and then the utilization estimates for the control group would be less than the true level. The opposite could also be true, where the visiting nurse's

records in her home agency are more complete than the Home Care records. In this case, the Home Care patient's utilization would be under-estimated. One advantage in using so many approaches to so many agencies is that information from one agency may 'flag' or point out that a patient is using another service, prompting study staff to look for a record at the second agency. Since prediction of which patients will use which agencies is impossible, this is an important point.

Specific Strategies

In this section, specific approaches to data collection will be described. The issues of reliability and accuracy will be discussed later in this chapter. To review the discussion of the data collection for the efffectiveness measures (see Appendix B), patients will be seen in face-to-face interview at 3 and 12 months post-entry into the study. The interviewers will be hired on a per-interview basis and will be blind to the group (experimental or control) membership of the patient, although they may be informed by the patient at interview. Given that this is an elderly and chronically ill population, the interviewers will be screened for their ability to relate to people in this group before data collection begins.

The following discussion of data collection techniques will be organized according to the type of technique, rather than the category of cost-related data sought. The reader is referred to Table 6.1 for a complete list of the categories and related data collection methods.

1. Hospital Record Abstraction

The main reason for this data is to determine the length of stay and the type of bed occupied (acute, chronic, rehabilitation) in order to apply the appropriate average fully allocated cost per type of day of care. The abstraction form (see Appendix F) contains space for date of admission and date of discharge since this is easier to abstract than calculating the length of stay at that time. Diagnoses are also needed in some instances for classifying the type of care, since hospitals do not necessarily always have acute patients on acute wards or chronic patients on chronic wards. In cases where the ward location and classification do not 'fit' then the patient will be assumed to use the resources expected for his acute, chronic or rehabilitation classification. Although the costs of the surgical suite and diagnostic services will be included in the average fully allocated cost in this study, there will be a professional fee attached and this will be a part of physician costs. The hospital is most likely to contain the proper name for O.H.I.P. filling of surgical procedures. Care will be taken to ensure that this is not double counted when the physician's records are reviewed. Records of the Emergency Departments will be abstracted separately, since these are not yet integrated with in-patient records in most hospitals. Day care days are also separate.

All hospital records will be abstracted at the end of the study year. With the patients' permission, given at the beginning of the study, the names of subjects will be given to the hospital records department along with their former patient number (at the hospitals

where intake took place) to facilitate record location. Death or discharge disposition will be noted as a way of cross-checking other data sources to keep track of patients, since a key problem in this study is becoming aware of health service utilizations among subjects. Transfers within hospital are noted to pick up any change in the type of ward (acute, chronic, or rehabilitation).

Data abstraction will be carried out by the research assistant hired by the study (see Appendix A). Since the information to be abstracted is fairly straight-forward and does not require interpretation or judgement on the part of the abstractor, as is the case in medical audit studies [25,102], it has been decided that a non-expert abstractor will be adequate for this study. It would be more rigourous methodologically to have two abstractors who could be kept blind to the group allocation of individual patients. This would ensure that reliability of the data collection method could be tested by having them regularly abstract the same records and compare the independent results. If they are kept blind to the group membership of patients, then this source of bias in the data has been checked, and we would expect no systematic difference, because of prior knowledge of the abstractor, in the data of control group members compared to the experimental group. However, this methodology is difficult to enact in this study due to the restraints of 'real world' research. The study is an expensive one (see Appendix A) in times of economic constraint, with a large component of independent interviewers and a large population for the effectiveness measures. In the interest of economy and because the data to be collected requires

no judgement or interpretation, it was decided that the research assistant could collect this data.

Prior to beginning the abstraction task, the research assistant will have a training period with the investigators to become familiar with the instrument and check for its ability to be efficiently used. The members of the Medical Records Departments of each hospital will be asked to review the charting mechanism with the study staff. A random sample of charts will be selected for training with the instrument. The research assistant and the project director will each abstract the information as required, and the agreement between the two will be summarized. This process will continue until the agreement is 95% or better, and all foreseeable difficulties in finding data have been solved. This process will be repeated at the half-way point in the data abstraction.

2. Physician's Office Records

Data from physician's offices is necessary for measuring costs of physician service as well as laboratory and x-ray services. In order to use the Ontario Health Insurance Plan Schedule of Benefits for cost determination, the data about physician visits must be classified in the format of billed procedures and billing codes. Physicians will also have to be asked whether or not they have opted out of O.H.I.P. and if opted out, whether or not they are going to charge this particular patient an increased fee above the O.H.I.P. benefit rate. Since this may be, but is not necessarily, the Ontario Medical Association fee, physicians will not be asked if they are going to charge the O.M.A. fee

specifically. Any data on surgical or diagnostic procedures for which the physician bills the patient will be collected and checked against hospital data to avoid duplicate counting. Referrals to specialists will be noted. Since the patient and the family physician have both consented to be in the study by the time of data collection, there should be no difficulty in relation to cooperation at this level. However, any specialist to whom the patient has been referred may refuse to participate. If this is the case, then data will be taken from the specialist's report to the attending physician. If the specialist agrees to participate, the data will be collected in the same way as in the family doctor's office.

In each physician's office, at least one clerical person (two if possible, for coverage on holidays) will be asked to assist by filling out daysheets for each study patient (see Appendix F). These will have space for all information needed including laboratory and x-ray data. Clerical helpers will be remunerated at the rate of $5.00 per patient for their assistance. They will be given a training period with the daysheets and an opportunity to alter its format if necessary to make it more amenable to use. A rehearsal with a random sample of charts will be carried out with reliability being checked out by either the two clerks or one clerk and the research assistant (where there is only one person available for the study). When agreement is 95%, the pre-testing will be finished. The study staff will be available for consultation at any time to the clerks and the daysheets will be collected monthly. At the end of the study, a random sample of office

charts will be abstracted by the research assistant to again check on accuracy of the data. Physicians will be asked to use carbon copies of all prescriptions for the study patients (including telephone orders) and will be assisted with this by placing carbon-ready prescription pads in the patients' charts. These carbons will be kept for the study staff to record drugs ordered. During the pilot feasibility study conducted early in 1979, the physicians were generally cooperative to the notion of their patients being seen in hospital by an assessment nurse, and it is hoped that with few demands on their time, their cooperation with this effort will also be positive.

Since all laboratory tests and x-rays (as out-patients) are ordered by the physician, this is the logical source of this data. As part of the day sheet information, the laboratory tests and x-rays ordered will be noted. These services are included in the average fully allocated cost per day of care for hospitalized patients.

3. Telephone Interviews

There are some 25 nursing homes and homes for the aged and retirement homes in the region, which are being approached for an indication of cooperation with the study. Some have already agreed to participate. Each cooperating institution will be informed of the names of the patients in confidence and with their permission. Each month, the study staff will be in touch with the institutions to see if any of the patients of interest have been admitted. This initial

case-finding will be supplemented with information from the family, other agencies and the patient as described below. Should any institutionalizations be noted from the physician's records, this will also assist in locating the patient. Nursing homes and other institutions will be asked to give admission and discharge data (or date of death) as well as whether the patient is in private, semi-private or ward accomodation. If the nursing homes are unable to supply this information, it will be asked of the patient or his family. If the nursing homes or other institutions prefer to use the mail or a personal visit for information exchange, they will be accomodated.

Other community agencies which provide service to home care will be canvassed the same way in the first instance in order to track the utilization of all subjects (including Home Care patients). This will include outpatient clinics for speech therapy or physiotherapy and social agencies which may be used by control group patients. Once a patient has been identified as using a particular service, the relevant agency records will be reviewed.

4. Record Review

Where patients have been listed as entering an institution (other than hospital) or obtaining the services from a community agency, the second phase of the data collection will consist of a review of the records of the appropriate agency and abstraction of the necessary data in a manner similar to the hospital record abstraction already

described, by the research assistant. In relation to institutions, the only data that is needed is the length of stay and the nature of the accomodation. It is hoped that this will be obtained either by telephone interview or by interview with the patient and his family. A small random sample of records will be reviewed in order to check the accuracy of the data. In the case of other agencies, information is necessary in relation to the patient's length of stay, number of visits or hours per week of service and any changes in this, whether the service is provided in the home or clinic, average miles per visit and average hours per visit. It is expected that this information, like the hospital data will be relatively easy to abstract. There may not always be clear information about the number of hours per visit or miles per visit in which case the averages calculated by the Home Care programme will be assumed to apply for purposes of using costs per mile or per hour. In order to apply cost measurement to the use of medical supplies the data needed is an indication of whether or not the patient has visiting nursing in the home, then a cost per case will be applied. In this area, there is no data to be abstracted from records.

5. Patient Interview

At the time of the outcome assessment interviews, the patient will be asked a series of questions in relation to whether or not the patient is using the services available, including rental of equipment

and a fewprivately purchased medical supplies. These questions will not be detailed or add great length to the interview, but will serve as a signal for study staff to seek out information at the appropriate agency. Certain information, such as the use of rented or borrowed sick-room equipment will also be picked up in other areas (physician's records, nursing records) if those areas record them. However, it is expected that this recording in other areas may not be consistent or complete. Patients will be asked about how they get to the physician's office or any clinics they attend and to judge roughly how long this usually takes. Distances will be used and calculated as described in Chapter 4 [Transportation] using maps and addresses. This admittedly crude way of measuring data for transportation costs and costs of lost time has been judged adequate given the fact that these components are expected to have small impact on the overall cost picture.

6. Family Interview

Since eligibility for Home Care, which is a criterion for entry into the study, indicates that there is a family member or caretaker in the home willing to assist the patient there will be some such person available for interview. The effectiveness study will include a brief interview with the family member or non-related caretaker in relation to the burden of caring for the patient in the home. At the same time, the questions asked of the patient regarding the use of

resources will be posed to this person, plus an estimate of time donated by themselves or others in order to care for the patient. If there is disagreement between the patient and the family member, the patient's ability to correctly answer questions will be determined by inquiry from the family doctor, and if impaired the family members responses will be used. Family members will also be sought if the patient is lost to follow-up, but only after checking with the family doctor in case of death in order to avoid placing undue stress on the family. Out-of-region institutionalizations will also be noted.

Other Data Sources

Originally, it was hoped that data from the O.H.I.P. files could be used to describe the utilization patterns in the two groups for physician's services and hospital services. However, there are problems associated with this both logistically and methodologically. Logistically, the use of O.H.I.P. data has been curtailed recently due to the on-going deliberations of the Krever Royal Commission on Confidentiality in Health Records, and communications with the Data Development Branch of the Ontario Ministry of Health were not encouraging in relation to the possibility of getting patient-specific data. Also, there is a time lag of about 6 months for O.H.I.P. data on physician visits, that is to say that a visit to the doctor today might not appear on the O.H.I.P. computerized records until 6 months from now. The O.H.I.P. identification system is based on one number

for a family rather than an individual, therefore the information can only be obtained by running through the data twice, once to find the family and again to find the patient by birth date. This increases the time and expense of the abstraction. Methodologically, there is some question from researchers about the accuracy of O.H.I.P. data because of the time lag and the fact that opted in/opted out status will not be revealed. Hence, this piece of information along with drug use, laboratory use and x-ray use would not be available from O.H.I.P., and would still necessitate going to the physician's records. The same holds true for the data obtained from hospital record review.

Since the original negotiations for the data for this study began, the Data Development Branch of the Ministry of Health has considered at some length the alternative ways of providing this information within the guidelines of protecting confidentiality. As a result of their deliberations, they have agreed to provide the data on number of physician's services and billing codes, hospital admissions, length of stay and discharge or death. This information will be provided to the patient with consent and the patient can provide it to the study [74]. This data would be available at a fee for the record search of $3000.00 for 200 patients or $6000.00 for the total study population. It was decided that, if funding is available for this aspect, the study will collect this data as well as the data collected as described above. While it is expected that the data collected directly from physicians and hospitals is more likely to be accurate and complete, at the same time valuable information

about the usefulness of O.H.I.P. data for studies of this type can be obtained by comparing the two data sets.

Issues of Reliability and Accuracy

The multiple-method approach to data collection described in the preceding sections has been developed partially because of the real world limits placed on data collection with a large number of sources, and partially to provide a series of checks and balances in the data collection system. This second reason for the system is an important, since the data to be collected exists at two levels. The first is data about what health services and volunteer services are used by any one patient. The second is data about the nature of the resource use in a particular agency or service.

In relation to the first level of data, it is to our advantage to have a number of avenues for checking on whether or not a patient has used a particular service. As illustrated in Table 6.1, this is possible in several instances. For example, admission to hospital may be picked up at the patient interview, the family interview, the physician's record, the visiting nursing record or the final hospital record search. For many other agency utilizations, the same relationship is likely to occur. This cross-checking and validating of information will serve to minimize the possibility of missing data. Out-of-region institutionalizations or other service use may be more difficult to discover, but will be sought at interview. It is not

expected that patients of this age group and illness category will change physicians often. However, this information will also be sought at interview. The O.H.I.P. data could be used as a criterion measure to check the accuracy of some data (with tests of agreement for nominal or categorical data) but it is expected that this data may not be as accurate as that collected here so this avenue will not be followed.

The issue of reliability and accuracy in data abstraction which is related to the second level of data will be handled in the manner described above in detail in relation to hospital record abstraction. All record reviews (that is in hospitals, other institutions and community agencies) will follow the same general procedure. Permission from the patient will be sought to abstract the pertinent records and cooperation from the agency or institution as well. During the early phase of the study, all instruments will be pre-tested for ease of administration and appropriateness of data. This will be done with the research assistant and the project director working together, except in the case of physician's office daysheets where the clerks will work together. A random sample of charts will be abstracted by two people until there is agreement at the level of 95% in terms of data collected. This procedure will be repeated with a random sample of charts of study patients at the end of the data collection period.

Consolidation of Data

For each patient, there will be a number of daysheets and abstraction sheets available at the end of the study (see Appendix F). The data on these will be edited for completeness and legibility by study staff. Physician's office daysheets and hospital abstraction sheets will be entered into the computer and stored as they become available. Other data will be consolidated on a master resource use sheet for coding and computer filing. Coding manuals will be developed during the early phases of the study; and coding checked with a random sample as in the case of record review.

Summary

This chapter has described the multiple-method approach to collection of resource utilization data in this study. Guiding principles have been that patient-specific information should be obtained wherever possible (as opposed to imputed values estimated from average or aggregate data) and that as many checks should be built into the system as possible in order to minimize the chance of missing data.

The system described will require the attention of most of the full-time research assistant's time, both in developing working relationships with agency and institution staff and in monitoring and collecting data. The process is feasible with organization and necessary in order to achieve as much accuracy as possible in cost measurement.

At the time of analysis, the data on each patient will be summarized as in Table 6.2 for application of cost measurement.

Table 6.2: Summary of Utilization Data Per Patient

Cost	
Hospital	Length of Stay/Type of Care Emergency Visits - Total Name of Hospital
Other Institution	Name Length of Stay Type of Accomodation
Physician Services	Billed Procedures - List Opted In/Opted Out
Community Agencies	Name Visits/Week Hours/Week Average Miles/Visit Average Hours/Visit
Laboratory	Services - List
X-Ray	Procedures - List
Medical Supplies	Nursing Visits - Yes/No Other Purchases - List
Equipment	Rented/Borrowed - List Agency
Transport	Mode(s) - List Time - Total
Helpers/Patient	Time

CHAPTER 7

DATA SUMMARY AND ANALYSIS

This chapter will describe the methods for summarizing and analyzing the cost and effectiveness data. The questions to be asked of the analysis will be reviewed. Sensitivity analyses will be outlined. Secondary analyses possibly of interest will be discussed.

Data Summary

Data will be available on 400 patients. Patients who have received Home Care and are in the experimental group will number 200. There will be 100 patients who receive Home Care although originally allocated to the control group. There will be 100 patients who are in the control group and have not received Home Care. The primary comparison of interest to the cost-effectiveness study is between the experimental group and the control group who have not received Home Care. Since the experimental group is twice the size of the control group, for certain cost data such as total costs, the value for the experimental group will be divided in half in order to equalize the sample size.

Health Effects Data

Scores on health effects data will be classified in two ways:

first, in terms of good, fair or poor function in each of the functional areas and second, as improved, no change and deteriorated from the time of initial assessment at entry into the study. Measures will be available at three months and twelve months after entry into the study. For each group, effects can be summarized in a table similar to the one illustrated in Table 7.1, where the number and percentage of patients in each cell are noted.

Table 7.1: Illustration of Effect Summary

Group (A) Experimental
(B) Control - Referred to Programme
(C) Control

3 month or 12 month] Assessment						
First Assessment	Good	Fair	Poor	Improved	No Change	Deteriorated
Good # /%	# / %					
Fair						
Poor						
	Number Died =					
	Number Lost to Follow-Up =					

Scores on the physical function, social function and morale scales will be classified as poor, fair or good function at each assessment. Changes will be determined in tabular form as in Table 7.2.

In comparing the experimental and control groups, the differences between them in terms of the improvement outcomes and the level of function outcomes will be determined and tabulated. These extra or additional outcomes with either Home Care or the control programme will be used in analyzing costs and effects.

Table 7.2: Illustration of Compared Effects

Functional Outcome [Physical] [Social] [Emotional]

Outcome Assessment

Initial Assessment	Good	Fair	Poor	Summary
Good			Worse	Improved: # / %
Fair				No Change: # / %
Poor	Better			Deteriorated: # / %

Table 7.3: Illustration of Extra Improvement

	Home Care		Control		Extra (HC - Control)	
	Number	Percent	Number	Percent	Number	Percent
Improved						
No Change						

These summaries will provide the information about effects necessary for the economic analysis. In the effectiveness study, the changes in effects between groups will be compared using tests of statistical significance [Chi-square tests of independence (Appendix B)].

In the first and primary analysis, the statistically significant differences will be the ones of interest, although the others can be analyzed in the secondary analysis to discover cost relationships, given equal health effects.

Cost Data

All costs will be summarized as described in equations (1) to (26) in Chapter 3 (pp. 68-70), and within each cost category. The categories are (1) Direct Intra-Programme Costs (DC^{Int})

(2) Direct Extra-Programme Costs (DC^{Ext})

(3) Direct Costs (DC)

(4) Indirect Costs (IC)

(5) Overall Costs (C)

Table 7.4 illustrates the summary statistics that can be developed for each category of costs. Once the costs for each programme are summarized, the incremental or extra costs with the more costly alternative can be calculated. Although we are interested in extra effects with Home Care on the effectiveness side, no difference in effects may also be important if costs differ. In the parallel area of extra costs, these may reside in either programme alternative and it will be important for the results to determine their relation to effects regardless of where they lie. In other words, the Home Care programme may be more costly than the control programme owing to the large number of services provided and the fact that these services, although available for private purchase, may not be used to the same

Table 7.4: Illustration of Summary Cost Statistics

Overall Costs

Per Patient	PTC_i	$= PtDC_i^{Int} + PtDC_i^{Ext} + PtIC_i$ = Sum of all costs for the ith patient
Total (Either Group)	TC	$= PtC_1 + PtC_2 + PtC_3 \ldots + PtC_n$ = sum of all costs for patients 1 to n = sum of all costs for the group
Total (Control)	TC_c	$= PtC_{c1} + PtC_{c2} + PtC_{c3} \ldots + PtC_{cn}$ = sum of all costs for the control group
Total (Experimental)	TC_e	$= PtC_{e1} + PtC_{e2} + PtC_{e3} \ldots + PtC_{en}$ = sum of all costs for the experimental group
Total (Experimental Adjusted)	$TC_{e/2}$	$= TC_e/2$ = sum of all costs for the experimental group adjusted to equalize sample size
Average Per Case	$\overline{C}$	= TC/ number in group = the total costs for a group divided by the number of patients in the group
Incremental	ΔC	$= TC_{e/2} - TC_c$ = total costs experimental minus total costs control
Incremental Per Case	$\Delta\overline{C}$	$= \overline{C}_e - \overline{C}_c$ = Average costs experimental minus average costs control

extent by the control group. In this case, the extra costs would accrue to the Home Care programme. On the other hand, the control programme may be more costly because of higher use of institutional resources in that group without the Home Care programme to maintain them out of hospital or nursing home. In this case, the control programme would incur the increased costs. The usual convention in describing extra or incremental costs is to subtract the control programme costs from the experimental programme costs and express these as positive (meaning extra costs of the experimental programme) or negative (meaning extra costs of the control programme).

Table 7.5 illustrates the final summary table that will be used for cost data in any one viewpoint.

Table 7.5: Summary Costs for Analysis

	Control		Home Care			Extra	
	Average Per Case	Total	Average Per Case	Total/200	Total/100	Incremental	Incremental Per Case
Overall							
Direct							
Intra-Programme							
Extra-Programme							
Indirect							

The first three research questions listed in Chapter 3 are about these descriptive summaries of costs, namely: what are the total and average per case costs for each group, and what are the incremental costs and incremental costs per case. The nature and description of costs in themselves, exclusive of effects at this point, are of interest and become more so if there is no difference in health effects with the alternative programmes. The focus of this interest will vary within viewpoints. For example, the individual patient may be interested in the out-of-pocket expenses in the two alternatives, whereas the Ministry of Health may be interested in the differences, if any, in direct costs of both the intra- and extra-programme type. If the programme of Home Care costs $500,000 dollars more from the Ministry of Health point of view, this represents an incremental cost of $500,000.00 per 100 patients, and an incremental cost of $5,000.00 per case. From the patient's viewpoint or incremental cost without Home Care of $20,000.00 for 100 cases and of $200.00 per individual case. From the societal viewpoint, of interest in particular to health planners and researchers, there might be an incremental cost in home care which is something less than that to the government because of the fact that the differences in the individual viewpoint enters the calculation as a negative cost with Home Care.

Primary Data Analysis

Without considering health effects, costs will be compared between the two groups and analyzed in each group for variation.

Costs and health effects will be compared in a variety of ways. The main analysis is concerned with the comparison of costs and effects between the experimental group and the control group and within the category of overall costs. Other analyses with different groups (for example, the group of control patients lost to Home Care by Referral) or other cost categories will be discussed as secondary analyses. Sensitivity analyses will also be discussed. The main analysis is concerned with the costs and health effects after one year of follow-up.

Cost Variation and Comparison

Although not all cost data in this study is directly measured and a number of components are based on a composite of assumptions and estimates, there will likely be sufficient patient-specific measurements to calculate a standard deviation for the mean (average) cost data. This will provide a measure of the variation around the mean cost value in each group, or in other words, of the spread in the data set of per patient costs. Since this is a randomly selected group with standard approaches to measurement of costs across individuals, the numbers should be amenable to the application of this type of descriptive statistic. The mean and standard deviation can then be applied to test for a significant difference in costs between the two groups being compared.

The standard deviation for the mean costs per patient in each group will be calculated as a measure of the variation about those means, using the following equation [19]:

$$\text{Standard Deviation} = \sqrt{\frac{\sum_{i=1}^{n} [(x_i - \bar{x})]^2}{n - 1}} \qquad (34)$$

where: x_i = costs for the ith patient

$\bar{x}$ = mean cost per patient

n = number of patients in the group

The difference between the means in the two comparison groups will be tested for statistical significance using Student's 't' test for independent means, with a probability of falsely rejecting the null hypothesis (Type I error) of $p = 0.05$. The null hypothesis is that there is no difference between the mean cost per case in the control group and the mean cost per case in the experimental group. This is illustrated symbolically below [19]:

H_0: $\bar{x}_e = \bar{x}_c$

H_1: $\bar{x}_e \neq \bar{x}_c$

Significance Level: $\alpha = 0.05$

Distribution: The sampling distribution is the Student t distribution with $n_c + n_e - 2$ degrees of freedom

Type of Test: Two-tailed

Decision: if $|t|_{198} \geq 1.96$, reject H_0

Formula:

$$t_{n_1 + n_2 - 2} = \frac{\bar{x}_e - \bar{x}_c}{\sqrt{s^2\left(\frac{1}{n_e} + \frac{1}{n_c}\right)}} \qquad (35)$$

where: $\bar{x}$ = mean costs per case

s^2 = pooled variance

$$= \frac{\sum(x_e - x_e)^2 + \sum(x_c - x_c)^2}{n_e + n_c - 2}$$

Since the sample size calculation for the effectiveness study (see Appendix B) included a sample size for the t-test (in relation to hospital stay) the sample size will be adequate for this test with cost data (assuming the same expected change in costs as in health service utilizations).

Comparison of Costs and Health Effects

Since the primary research question of the effectiveness study asks whether or not Home Care increases physical function, social function and morale, the focus of this primary analysis of costs and health effects will be on the possible result that Home Care is more effective than the control programme. However, the questions from an economic stand-point are equally relevant if the control programme is more effective, particularly since the Home Care programme is already in place, and cost comparisons are relevant if there is no difference in effects.

The first question that can be asked of the costs and effects is concerned with the total cost of the Home Care programme for the

amount of effects produced. In other words, if the percentage of improvement in Home Care is 30%, then what has that cost? This simply asks for a descriptive comparison of costs and health outcomes, without comparing across groups, and the comparison is usually expressed as dollars cost per units of health effect. In this case, it might be $500,000.00 per year for a 30% improvement in physical function for 100 patients. By looking at the average cost per case in a similar way, costs can be related to health effects without reference to the size of this specific sample. Then one might say that $5,000.00 per year produces a 30% probability of improvement in physical function for one patient, or that for a cost per patient of $5,000.00 there will be a 30% improvement in physical function over 1 year in a group of Home Care patients. The cost and effectiveness measures will be displayed together and compared in Tables 7.6 and 7.7.

The next question might be: given a 30% improvement in Home Care and a 20% improvement in the control programme with costs of $500,000.00 and $400,000.00 per year in each respective programme, what are the extra costs of Home Care relative to the extra improvement in function? In this instance, the incremental costs of Home Care can be compared to the extra improvement in function in much the same manner as described above for total and average costs. For instance, in the example given, for an extra $100,000.00 per year per 100 patients there is a 10% increase in improvement.

If the incremental costs are negative, meaning that the Home Care programme costs less than the control programme, and the change

Table 7.6: Costs and Health Outcomes by Programme

		Control of Group	Home Care Group
FUNCTION	Good		
	Fair		
	Poor		
	Improved		
	No Change		
	Worse		
COST	Total		
	Average Per Case		

Table 7.7: Costs Related to Positive Outcomes

	Total Costs per Percent in this Category		Average per Case Cost per Percent in this Category	
	Control	Home Care	Control	Home Care
Good				
Fair				
	Total Costs per Percent Improvement/No Change		Average per Case Cost per Percent Improvement/ No Change	
	Control	Home Care	Control	Home Care
Improved				
No Change				

in effects is still positive, then we might say that for $100,000.00 less per year per 100 patients there is a 10% increase in improvement.

Similar questions can be asked about the incremental costs per case and changes in improvement. For example, if the incremental cost per patient is $1,000.00 and the extra improvement is 10%, then the summary might be that in any group of patients on Home Care there will be an increase of 10% in improvement (over the usual pattern of care) at an increased cost per case of $1,000.00

It is important to note that any increase or decrease in costs summarized in this way can only be discussed within the context of the comparison of interest; in this case Home Care versus No Home Care for patients aged 65 and over with specified diagnoses entered into the alternative programmes at discharge from hospital. There may be other changes in the health system as a result of Home Care which increase, decrease or cancel out the extra costs (or the 'saved' costs). For example, if the beds not used in hospital by Home Care patients are filled by persons more acutely ill, then, in terms of the whole system the costs are increased further. In fact these beds add costs even if empty, as will be discussed in Appendix C.

The next question might be related to the costs for one improved case on Home Care. Since the total programme must be mounted in order to produce 30 improved patients in terms of physical function in our example, then the cost of producing one improved case is equal to the total costs divided by the total number of improved cases or $16,666.67. Similarly, the costs for an

improved case in the control group can be calculated. In this example, with total costs of $40,000.00 and 20 improved patients, the cost per improved case would be $20,000.00.

Finally, we could ask how much the extra costs are in Home Care for one additional improved case. Given that the incremental costs are $100,000.00 and there are 10 extra cases that improved, the extra costs per additional improved case in Home Care would be $10,000.00. In other words, whereas the control programme produces improved cases at a cost of $20,000.00 each, the Home Care programme produces additional improved cases at an added cost of $10,000.00 each.

These statistics developed to compare costs and effects between the two alternative programmes are listed in Table 7.8. The implications and limitations of the results are discussed in Chapter 8.

Implications of Effectiveness Results

The analysis described above is based on the assumption that the results will faviour Home Care as the more effective programme, although it may be more costly in terms of total costs. The results of the effectiveness study may reveal that either the No Home Care programme is more effective in terms of the outcomes to be measured or that there is no difference in outcome between the two programmes. In the first instance, the same analysis can be carried out looking at the costs related to increased improvement in the usual form of treatment. If there is no difference between programmes, then the

Table 7.8: Summary of Cost/Effectiveness Measures*

1. Descriptive Summaries (Each Group)

a) Costs per Percent Improvement

Across all patients in the group, what are the costs relative to the percentage improvement?

b) Costs per Number Improved

Across all patients, what are the costs relative to the number improved?

c) Average Costs per Case per Percent Improvement

What is the average cost for one patient relative to the probability of improvement?

In any group, what is the average cost for one patient relative to the percent improvement in the group?

d) Costs per Improved Case

What are the costs of the production of one improved case in the programme ?

2. Comparative Summaries (Between Groups)

a) Incremental Costs per Percent/Number Improvement

What are the incremental or extra costs in the superior programme relative to the improvement in that programme?

b) Incremental Costs per Case per Improvement

What are the extra costs per case in the superior programme relative to the improvement in that programme?

c) Incremental Costs per Additional Improved Case

What are the extra costs in the superior programme for each additional improved case?

* Similar questions will be asked in relation to costs and patients in each functional status category.

costs alone can be compared to indicate which programme minimizes costs for the same effects.

There are four possibilities in relation to the direct comparison of costs to effects between the two programmes, which can be graphically represented in Table 7.9 (excluding no difference).

Table 7.9: Outcome Possibilities

Costs Home Care Relative to Control

		More	Less
Effects Home Care Relative to Control	Better	a	b
	Worse	c	d

If the results are in cell (a), that is, if Home Care costs more and produces more effects than the control programme, then analysis will proceed as above. If the results are in cell (b), where Home Care costs less but produces more effects, then the analysis can proceed as above, but the extra costs will represent savings (within the context of this comparison, but not necessarily throughout the system). If the results are in either of cells (c) or (d) it is unlikely that the programme would be maintained, but the analysis could still be done in relation to the control programme as the one producing 'extra' effects. Since this is the usual form of care, it is unlikely that its costs per effect would need to be justified in the same way as the Home Care programme. Where the Home Care programme costs less and produces fewer effects, further examination of the data may reveal equal costs per improved case.

Secondary Analyses

Certain cost categories will be of interest to specific groups of consumers of the results of this study. Hence analyses within these specific categories of cost will be carried out in the same manner as described in the previous section.

The first category of interest is the direct intra-programme cost which may be of particular interest to the Home Care programme staff and Ministry of Health officials interested in the planning of similar programmes. At the time of analysis, the limitations on approaching the analysis from one particular cost category will be emphasized (see Chapter 8) since discrepancies here should not be interpretated as operative across all viewpoints or all segments of the Health Care economy. The second category of major interest to the Ministry of Health will be the direct extra-programme costs which will give an indication of differences in use of other resources in the health care system between the alternatives. Again, limitations on the interpretation of these data will be pointed out.

There are several analyses within the effectiveness study which may lead to further analyses in the cost-effectiveness section. The analysis techniques described above will be used to look at these data. Specifically, the experimental group (A) will be compared to the group of patients originally assigned to the control group but lost to Home Care (B), by way of selecting a group of equal size from the larger experimental group through matching. In addition, the control

group (C) (who do not receive Home Care) will be compared to a similarly matched group of experimental patients. It may be possible, given the numbers of patients available, to compare the group who are referred to Home Care (B) before and after referral in relation to costs and health effects to see if the pattern for these patients alters significantly.

Sensitivity Analyses

As indicated in Chapters 4 and 5, several assumptions about costs will be challenged through sensitivity analysis. In order to do this certain costs will be altered according to the list in Table 7.10 and the analysis re-done within each viewpoint. The purpose of this exercise is to determine if, when the relevant costs are altered as assumptions change, there is a corresponding alteration in the overall results of the study. Thus, the imprecision of some cost measures is acknowledged and the alternative possibilities with the alternative cost measurements and their implications can be discussed.

Certain of these measurement changes come about as a result of ongoing controversy about whether such costs ought to be included in economic analysis, as is the case in the lost leisure time issue described earlier. Other sensitivity analyses are done because of assumptions made in the cost measurement strategy which might not be accurate, as in the example of assuming that all hospital costs will

be similar to the Chedoke costs. Still others are done because of acknowledged imprecision in the data collection, as in the case of Public Health Nursing costs or because of price variations unrelated to resource use as in the case of medical supplies.

Table 7.10: Sensitivity Analyses

Cost	Variation
Medical Supplies	Replace Home Care prices (reduced) with prices for No Home Care group
Hospital	Increase/Decrease average fully allocated cost by a factor equal to the difference in per diem rates other hospitals/Chedoke e.g. if rate 10% higher then average fully allocated cost x 1.10
Public Health Nursing	Increase by $1.00 and $2.00 per visit Decrease by $1.00 per visit
Volunteer Time & Patient Time	Remove all costs of this type
Friendly Visitors Other donated time	Add costs of time

The results of all sensitivity analyses will be described separately and where a large difference in the overall outcome of the study occurs, the implications of this will be discussed. Each sensitivity analysis will proceed as described above and the proportion of overall costs accounted for by this component noted. The extreme values for each variable in Table 7.10 will then be combined in analysis to look for interaction between variables. Where the results change, different combinations of the variables will be analyzed.

CHAPTER 8

DISCUSSION AND SUMMARY

This chapter will review the analyses described in Chapter 7 with discussion of the implications and interpretation of various potential alternative results. Implications and limitations of the study will be described. Ethical issues will be addressed briefly and the study will be summarized.

Interpretation of Analysis

Referring back to Table 7.9 (P. 175) it is apparent that there are four possible combinations of health effects and costs when the two groups are compared looking at increases or decreases in effects and/or costs. The first of these, where Home Care costs more and produces more effects requires analysis in relation to how much extra cost there is in relation to extra effects. For decision-makers, the production of 20% more effects for 100,000 more dollars would be more attractive than the production of the same increase in effects for 500,000 more dollars. Cost-effectiveness measures such as incremental costs per improved case and incremental costs per additional improved case are important indicators here. It does not necessarily follow that an increase in cost ~~will result in a~~ negative decision about the

future of a programme, since the health effects produced may justify the expense and other factors than economic ones are always brought to bear on decisions such as this. In the example used in Chapter 7, even with increased overall costs, the investment per improved case was lower with Home Care and became halved when considering extra costs for an additional improved case. Political realities, prevailing provincial health goals and funding prospects can all influence the decision as much as the results of a study such as this.

If Home Care costs less but produces more positive health effects, then the programme is clearly cost-effective given that it minimizes costs and maximizes effects when compared with the alternative of the usual form of community care for this group of patients. In this instance, if one were interested in merely 'selling' the programme the case could rest here. However, it is beneficial to be able to determine where the differences between groups lie, and the size and nature of the differences in relation to the various approaches to expressing the relationship between costs and effects. In this case, the incremental costs represent 'savings' with Home Care in terms of the produced effects and in comparison with the alternative described. It does not mean that costs are saved through the entire health care system, which we do not know because we have not examined the other changes that occur in the system concurrent with Home Care. For example, the resources freed up by the Home Care programme (represented by the 'saved' costs) may be used for other purposes within the system rather than being truly freed up for other uses and eliminated as costs

from the health care system. One illustration of this is the issue of what happens to the hospital beds that these persons would have occupied. If the beds are eliminated and incur no costs then they can be said to be freed up and the resources available for other uses. However, if not closed they will generate costs ranging from the minimal costs of building maintenance to the costs of similar patients to the costs of more acutely ill patients.

If the Home Care programme costs more and produces fewer health effects it clearly is not the programme of choice in this comparison. Again, as in the case above, the nature of the extra improvement per lower cost in the control programme can be described in order to determine the nature and location of the differences. This exercise will justify the status quo or current practice from an economic point of view. Again, political realities and other priorities will also be considered when considering the fate of Home Care programmes.

If the Home Care programme produces fewer health effects but costs less, then the interpretation is less clear and the analysis as described in Chapter 7 will help clarify the type and magnitude of these differences. It may turn out, for example, that while overall effects are less the reduction in costs is such that it is still less costly for one improved case with Home Care or that the incremental cost for one more improved case in the control programme is so high that it is difficult to justify to those who control budgets.

Finally, the conclusions that are drawn from the study may depend on why the cost results look the way they do. If the costs are increased by some aspect of the programme which has little influence on outcome, then the programme may be more cost-effective if this component of the programme were removed. This is one underlying reason for doing sensitivity analysis on the costing of volunteer and donated time, since these costs may very well falsely increase the costs and hence decrease the apparent cost-effectiveness of the programme. Since the costing of donated leisure time is controversial, many would say that the programme is then 'undersold' if these costs are included. Similarly, if the programme is only slightly more expensive and this is insignificant on a t-test, then the removal of some components which are unrelated to health effects from the cost calculations may make the programme significantly less expensive and more cost-effective.

Limitations on the Results

A central characteristic of this study is that, unlike most economic analyses, it is imbedded within the context of a randomized trial of Home Care versus No Home Care in the community for a specified group of patients. While this allows more powerful statements about the comparisons between groups because of its methodologic rigour and avoids the issue of assuming health effects that often plagues other studies, it also places clear limits on the

interpretation of the results. The cost-effectiveness results discovered here will apply only to the group of patients in question in the alternatives of two forms of community care. Since this group is a large portion of the case load of the programme it is expected that the results will apply to a majority of the programme. However, the cost-effectiveness of the total programme is not examined here. Moreover, the question of whether or not the total programme saves dollars from the government viewpoint is not addressed here. As mentioned earlier and described in Appendix C, this issue requires close examination of the total system with and without Home Care.

In addition, the programme is not compared to hospitalization or other forms of institutionalization in a direct way. It is true that either group may use institutional care at different times in the study and it is expected that the control group will use institutions more. However, the Home Care group in this study is not exclusively Home Care as opposed to an alternative which is exclusively institutional care. This is in contrast to most studies in the literature, which attempt to compare these two forms of care as mutually exclusive and independent of each other, but it is felt by the research group involved in this work that such a comparison is artificial. The comparison of interest here with two alternative forms of care where the patient moves in and out of the health care system from a home base is a closer approximation of the real experience of these people.

Where certain categories of cost (other than overall costs) are examined as described in the secondary analysis section of the previous chapter, any presentation of the results must be prefaced with a clear statement about the fact that this does not represent all costs related to Home Care and its alternative, but rather those costs generated by a specific portion of the cost components only. For example, if the administrator of the programme were interested in examining the intra-programme costs in comparison to similar costs to the government in the control programme, then she must clearly state that the overall costs might be quite different and that these costs do not represent all costs generated by the programme and borne by the government. Similarly, viewpoint must be clearly stated in order to limit the interpretations that might be made to that framework. For example, where Home Care may be expensive from the government point of view but cost-saving from the individual patient's point of view the results will have a different meaning to each group.

Finally, the results of economic analysis are an addition to rather than a replacement for the resources that a decision-maker or a decision-making body brings to bear on a problem of resource allocation. As mentioned earlier, the vagaries of the political climate, committments to certain goals either in terms of resource use or health achievements and the other services available all play a part in such decisions.

Ethical Considerations

Since the Home Care programme in Hamilton-Wentworth is a pilot project that has not been extended universally throughout the province of Ontario, it is judged that one mandate of the programme is evaluation in order to make decisions about possible expansion to a province-wide status. The design of the randomized study does not place any restrictions on the ability of control patients to receive Home Care if they would have in the absence of the research programme. Therefore, service is not being withheld from patients.

Certain patients and physicians will not be informed that the study is an evaluation of Home Care, but rather that it is designed to determine the community needs of the elderly. This is justified because of the fact that revelation of the true goal would seriously jeopardize the design of the study. It is expected that this would generate use of Home Care and increase loss to the control group to the point that no comparison might be possible. Similarly, patients in the control group cannot be informed at the beginning that they will be offered Home Care (if effective) at the end of the study.

The issue of reimbursing patients for out-of-pocket expenses at the end of the study (if the control patients incur more of these expenses) is related to offering the effective treatment at the end. For the purposes of this study it is judged that the out-of-pocket expenses will not be reimbursed because in the parallel effectiveness

situation the patient is not reimbursed in terms of pain and suffering and the ethical issues are the same. Without the study, these patients would still not have received Home Care since there are no barriers to referral built in to the study. Therefore, the patient should be offered Home Care, but there is no reason to reimburse for expenses incurred.

Summary

This thesis has described the design of a cost-effectiveness analysis for the Hamilton-Wentworth Home Care Programme for a specific group of elderly patients as compared to the usual form of treatment in the community after discharge from acute-care hospital.

Methods have been developed for measuring all costs associated with the programme alternatives and for collecting health service utilization data necessary for cost-measurement.

Approaches to analysis have been described and the limitations on the interpretation of the results have been outlined. The study should provide definitive information about costs in the two alternative forms of treatment. The design is strengthened by the randomized trial format and techniques developed to measure patient-specific costs. A review of the relevant literature has revealed that no similar studies have been done to date.

REFERENCES*

1. Aldrich, C.K. and Mendkoff, E. "Relocation of the aged and disabled: A mortality study" Journal of the American Geriatric Society 2: 185-194, 1963

2. Baum, D.J. The Final Plateau: the betrayal of our older citizens Toronto: Burns and MacEachern Ltd., 1974

3. Berman, H.J. and Weeks, L.E. The Financial Management of Hospitals Ann Arbor: Health Administration Press, 1974

4. Bluestone, E.M. "The Principles and Practices of Home Care" Journal of the American Medical Association 155: 1379, 1954

5. Boucher, R. McMaster University Medical Centre Personal Communication, Hamilton: July 1979

6. Brickner, P.W., Duque, Sr.T., Kaufman, A. et al. "The Homebound Aged: A Medically Unreached Group" Annals of Internal Medicine 82(1): 1-6, January 1975

7. Bryant, N.H., Candland, L., Loewenstein, R. "Comparison of Care and Cost Outcomes for Stroke Patients With and Without Home Care" Stroke 5: 54-59, January-February 1974

8. Canada. Department of Labour. Wage Rates, Salaries and Hours of Work Ottawa: Published Annually

9. Canadian Hospital Association, Canadian Hospital Accounting Manual Toronto: 1968

10. Canadian Hospital Association, Canadian Hospital Accounting Manual Supplement Troonto: 1974

11. Cang, Stephen "An Alternative to Hospital" The Lancet 1:742-743, April 2, 1977

12. Cannell, C.F., Fisher, G. and Bakker, T. "Reporting of Hospitalization in the Health Interview Survey" Vital and Health Statistics, United States Public Health Service, Series 2, No. 6, July 1965

*This list contains references cited in the text as well as others that were important in conceptualizing the research issues.

13. Chambers, L.W., Sackett, D.L., MacPherson, A.S. The Development and Application of Indexes of Health: Methodologic Documentation and Report of the First Generation of Studies St. John's, Newfoundland: Memorial University, 1976

14. Chedoke Hospitals. Statement of Operating Expenditures - 1977-78 Hamilton: 1978

15. Cherkasky, M. "The Montefiore Hospital Home Care Program" American Journal of Public Health 39: 163, 1949

16. Cherniak, R.M. "Home Care of Chronic Respiratory Disease" Journal of the American Medical Association 208 (5): 821-24, 1969

17. Cochrane, A.L. Effectiveness and Efficiency: Random Reflections on Health Services Abingdon, Bershire: The Nuffield Provincial Hospitals Trust, 1972

18. Colt, A.M., Anderson, N., Scott, H.D., Zimmerman, H. "Home Health Care is Good Economics" Nursing Outlook 25:632-36, Oct. 1977

19. Colton, T. Statistics in Medicine Boston: Little, Brown and Co., 1974

20. Crane, L. "Home Care Programs in B.C." Hospital Administration in Canada : 28, October 1975

21. Creese, A.L. and Fielden, R. "Hospital or home care for the severely disabled: A cost comparison" British Journal of Preventive and Social Medicine 31: 116-121, 1977

22. Dale, B.T. and Braund, M.R. "This Home Care Program is Saving Dollars and Patient Days" Canadian Hospitals 45(10):86-88, 1968

23. Doherty, N. and Hicks, B. "Cost-Effectiveness Analysis and Alternative Health Care Programs for the Elderly" Health Services Research 12: 190-203, Summer 1977

24. Donabedian, A. and Rosenfeld, L.S. "Follow-up Study of Chronically Ill Patients Discharged from Hospital" Journal of Chronic Diseases 17: 847-862, 1964

25. Donabedian, A. A Guide to Medical Care Administration (Volume II) Washington: American Public Health Association, 1969

26. Echeverri, O. et al. "Post-operative care: In hospital or at home?" International Journal of Health Services 2(1): 101-110, 1972

27. Edgar, L. "Home Delivery - Dutch Style" Canadian Nurse 71(10): 36-38, October 1975

28. Epstein, L.M., Avni, A., Hopp, C. et al. "Evaluation of a Program of Aftercare for Patients Discharged from Hospital" Medical Care 11(4): 320-37, 1973

29. Evans, R.G. "Beyond the Medical Marketplace: Expenditure, Utilization and Pricing of Insured Health in Canada" in Spyros Andreopoulos (ed.) National Health Insurance: Can We Learn from Canada? New York: John Wiley and Sons, 1975

30. Evans, R.G. and Robinson, G.C. An Evaluation of the Economic Implications of a Day Care Surgery Unit Final Report: National Health and Welfare Grant # 610-21-14, Vancouver: October 1973

31. Fenton, F.R., Tessier, L., Struening, E.L. "A comparative trial of home and hospital psychiatric care: one year follow-up" Archives of General Psychiatry In Press

32. Fraser, R.D., Spasoff, R.A., Prime, M.G. et al. An Estimate of the Economic Burden of Ill-Health Toronto: Ontario Council of Health, 1976

33. Freeman, J.T. "Post Hospital Care of the Patient Past 65" Geriatrics 26: 121-128, 1971

34. Frieson, H. "A home care program for respiratory patients" Canadian Hospital 50(3): 40-44, March 1973

35. Fuchs, Victor R. Who Shall Live?: Health, Economics and Social Choice New York: Basic Books Inc., 1974

36. Gerson, L.W. and Hughes, O.P. "A comparative study of the economics of home care" International Journal of Health Services 6(4): 543-555, 1976

37. Gersten, J.W., Cankovich, F., Dinken, H. et al. "Evaluation of Rehabilitation in Home or Clinic Setting: Problems in Methodology" Archives of Physical Medicine and Rehabilitation 47: 199-203, 1966

38. Gersten, J.W., Miller, B., Cenkovich, F. et al. "Comparison of Home and Clinic Rehabilitation for Chronically Ill and Physically Disabled Persons" Archives of Physical Medicine and Rehabilitation 49: 615-642, 1968

39. Gibbon, M. and Stevens, E. Nurse Influence on the Quality of Life of Elderly Patients with Chronic Illness Final Report: Health and Welfare Canada Research Grant # 606-1255-44.

40. Glajchen, D. "A Home Care Programme for Elderly Patients in Johannesburg" South African Medical Journal 44: 615-618, 1970

41. Goffman, Erving Asylums Garden City, New York: Doubleday, 1961

42. Goldmann, F. "Home Care for the Needy and the Medically Needy" Journal of the American Medical Association 148: 1085-88, 1952

43. Griffith, G.C. "Home Care for the Aged Cardiac Patient" Geriatrics 22: 140-143, 1967

44. Hamilton-Wentworth Home Care Programme, Operating Budget - 1979-80 Hamilton: 1979

45. Health and Welfare Canada, Final Report of the Working Group on Home Care Programs to the Adisory Committee on Community Health. Health Programs Branch. Ottawa: June 1975

46. Health and Welfare Canada, Final Report of the Working Group on Program Evalaution to the Sub-Committee on Quality of Care And Research and the Advisory Committee on Health Insurance Health Programs Branch Ottawa, 1977

47. Health and Welfare Canada, Health Services for the Elderly Final Report of the Working Group of the Federal-Provincial Advisory Committee on Community Health, Health Programs Branch Ottawa: August 1976

48. Health and Welfare Canada, National Health Expenditures in Canada 1960-1973: With Comparative Data for the United States Health Economics and Statistics Division, Health Programs Branch. Ottawa: April 1975

49. Health and Welfare Canada. National Health Expenditures in Canada 1960-1975 Unpublished Data. Health Economics and Statistics Division, Health Programs Branch. Ottawa: 1977

50. Health and Welfare Canada, National Health Expenditures as a Percentage of the Gross National Product 1965-1975 Unpublished Data, Health Economics and Statistics Division, Health Programs Branch. Ottawa: December 1977

51. Health and Welfare Canada, National Health Expenditures for 1976 Unpublished Data, Health Economics and Statistics Division, Health Services and Promotion Branch. Ottawa: 1978

52. Hill, J.D., Hampton, J.R., Mitchell, J.R.A. "A Randomized Trial of Hoem-versus-Hospital Management for Patients with Suspected Myocardial Infarction" The Lancet 1: April 22, 1978

53. "Hospital Fees: Chronic Patients Facing $9.80 a Day" The Globe and Mail Toronto: January 20,1979 p. 5

54. Hunt, T.E. and Crichton, R.D. "Ont Third of a Million Days of Care at Home" Canadian Medical Association Journal 116: 1351-1355, June 18,1977

55. Hurtado, A.V., Greenlick, M.R., Saward, E.W. Home Care and Extended Care in a Comprehensive Prepayment Plan. Health Services Monographs Series. Chicago: Health Research and Educational Trust,1972

56. Illich, Ivan Limits to Medecine. Medical Nemesis: The Expropriation of Health Toronto: McLelland and Stewart, 1976

57. Ingbar, M.L. and Lee, S.S. "Economic Analysis as a Tool of Program Evaluation: Costs in a Home Care Program" in S.J. Axelrod (ed.) The Economics of Health and Medical Care Proceedings of the Conference on the Economics of Health and Medical Care (May 10-12, 1962) Ann Arbor: University of Michigan, 1964

58. Johnson, W.J. et al. "Hemodialysis" Archives of Internal Medecine 125: 462-467, March 1970

59. Katz, S. et al. "The effects of continued care: A study of chronic illness in the home" American Journal of Public Health 62(8): 1094, August 1972

60. Klarman, H.E., Francis, J.O'S., Rosenthal, G.D. "Cost-effectiveness analysis applied to the treatment of chronic renal disease" Medical Care 6(1): 48-54, 1968

61. Klarman, H.E. "Application of Cost-Benefit Analysis to the Health Services and the Special Case of Technologic Innovation" International Journal of Health Services 4(2): 325-52, 1974

62. Knowles, J.H. "The Medical Center and the Community Health Center" in Social Policy for Health Care New York: New York Academy of Medicine, 1969

63. Krause, A.S. and Armstrong, M.I. "Effect of Chronic Home Care on Admission to Institutions Providing Long-Term Care" Canadian Medical Association Journal 177: 747-49, Oct.8, 1977

64. Lavor, J. and Callender, M. "Home Health Cost-Effectiveness: What are We Measuring?" Medical Care 14(10): 866-72, 1976

65. Lawton, M.P. "The Dimensions of Morale" in D. Kent, R. Kastenbaum and S. Sherwood (eds.) Research, Planning and Action for the Elderly New York: Behavioural Publications, 1972

66. LeClair, M. "The Canadian Health Care System" in S. Andreopoulos (ed.) National Health Insurance: Can We Learn from the Canadian Experience? New York: John Wiley and Sons, 1975

67. Lieberman, M.A."Relationship of mortality rates to entrance to a home fro the aged" Geriatrics 16: 515-519, 1961

68. Leslie, K.M. Administrator, Chedoke Hospitals Hamilton. Personal Communication. Hamilton: July 1979

69. Levin, H.M. "Cost-Effectiveness Analysis in Evaluation Research" in M. Guttentag and E.L. Struening (eds.) Handbook of Evaluation Research(Volume II) Beverly Hills: Sage, 1975

70. Lewis, D., and Mackey, M."Home care program cuts dollars and days" Canadian Hospital 50(5): 37-40, 1973

71. Librach, G. Davidson, C., Peretz, A. "A Community Home Care Programme" Journal of the American Geriatrics Society 20(10): 500-509, 1972

72. Lubic, R.W. "The effect of cost on patterns of maternity care" Nursing Clinics of North America 10(2): 229-39, June 1975

73. MacDonnell, J.A.K., Murray, G.B. "An Index of Care" Medical Service Journal of Canada 21: 499-519, 1965

74. McKillop, H.I., Director, Data Development and Evaluation Branch, Ontario Ministry of Health, Personal Communication to Miss M. Gibbon, Hamilton: June 1979

75. Markson, E.W., Levitz, G.S., Gogralons-Caillard, M. "The Elderly and the Community Re-identifying Unmet Needs" Journal of Gerontology 28(4): 503-509, 1973

76. Markus, N. "Home Care for the Aged" in On Growing Old, The Canadian Council on Social Development 12(1): February 1974

77. Mather, H.G. et al. Myocardial infarction: A comparison between home and hospital care for patients" British Medical Journal 1(6015): 925-929, 1976

78. Migue, J-L. and Belanger, G. The Price of Health Toronto: Macmillan of Canada, 1974

79. Mitchell, J.B. "Patient Outcomes in Alternative Long-Term Care Settings" Medical Care 16(6): 439-452, June 1978

80. Morris, R. and Harris, E. "Home Health Services in Massachusetts, 1971: Their Role in Care of the Long-Term Sick" American Journal of Public Health 62(8): 1088-1093, 1972

81. Morris, R. "The Development of Parallel Services for the Elderly and Disabled: Some Financial Dimensions" Gerontologist 14(1): 14-19, February 1974

82. Nielsen, M., Blenkner, M., Bloom, M. et al. "Older Persons After Hospitalization: A Controlled Study of Home Aide Service" American Journal of Public Health 62(8): 1094-1101, 1972

83. Ontario Medical Association, Schedule of Suggested Fees, Toronto: Published Annually

84. Ontario Ministry of Health, Drug Benefit Formulary--Parcost Comparative Drug Index Toronto: Published Annually

85. Ontario Ministry of Health, Health Care for the Aged Toronto: The Ontario Council of Health, 1978

86. Ontario Ministry of Health, Hospital Statistics:1977-78 Toronto: 1978

87. Ontario Ministry of Health, Ontario Health Insurance Plan Schedule of Benefits Toronto: Published Annually

88. Ontario Ministry of Health, Report on the Evaluation of Chronic Home Care Toronto: Mimeo, November 1977

89. Ontario Ministry of Labour, The Employment Standards Act, Labour Standards Branch, Toronto: 1975

90. Opit, L.J. "Domiciliary Care for the Elderly Sick - Economy or Neglect?" British Medical Journal 1(6052): 30-33, Jan 1,1977

91. Parsons, T. The Social System New York: Free Press, 1951

92. Rioux, C. "Health and social services under the same roof" The Canadian Nurse 71(5): 24-26, May 1975

93. Rossman, I. "The Montefiore Hospital after-care program" Nursing Outlook 22(5): 325, May 1974

94. Roth, M. "Natural history of mental disorder in old age" Journal of Mental Science 101: 281-301, 1951

95. Roth, M., Erhinger, R., Mosher, W. "The Value of Coordinated and Comprehensive Home Care" American Journal of Public Health 57: 1841, 1967

96. Ryder, C. and Frank, B. "Coordinated Home Care Programs in Community Health Agencies: A Decade of Progress" American Journal of Public Health 58: 261, 1967

97. Sackett, D.L., Chamber, L.W., Macpherson, A.S. et al. "The Development and Application of Indexes of Health: General Methods and a Summary of Results" American Journal of Public Health 67: 423-428, 1977

98. Schwenger, C.W. "Keep the Old Folks at Home" (Editorial) Canadian Journal of Public Health 65: 417, 1974

99. Science Council of Canada, Population, Technology and Resources (Report #25) Ottawa: 1976

100. Seawell, L.V. Hospital Accounting and Financial Management Berwyn, Illinois: Physician's Record Company, 1964

101. Shah, C.P. et al. "Day care surgery for children" Medical Care 10(5): 437-450, September-October 1972

102. Sibley, J.C., Spitzer, W.O., Rudnick, V.K. et al. "Quality of Care Appraisal in Primary Care: A Quantitative Method" Annals of Internal Medicine 83(1): 46-52, 1975

103. Soderstrom, L. The Canadian Health System London: Croom Helm, 1978

104. Somers, A.R. and Bryant, N.H. (Editorial) "Home Care: Much Needed Much Neglected" Annals of Internal Medicine 82(1): 111-112, 1975

105. Spitzer, W.O., Fedor, E.Y., Cox, M.E. et al. Source and Reference Manual for the Composite Index of Health Care Costs Methodological Report on Demonstration Project. New York: Microfiche Publications N.A.P.S. Document # 2347, 1973

106. Spitzer, W.O. , Roberts, R.S., Delmore, T. "Nurse Practitioners in Primary Care V. Development of the Utilization and Financial Index to measure effects of their deployment" Canadian Medical Association Journal 114: 1099-1102 June 19, 1976

107. Stason, W.B. and Weinstein, M.C. "Allocation of Resources to Manage Hypertension". New England Journal of Medicine 296 (13): 732-739, March 31, 1977

108. Statistics Canada. Consumer Prices and Price Indexes Catalogue # 62-010, Ottawa: Published Quarterly.

109. Steinberg, F.U. "The management of patients with spinal cord injury by a hospital-based home care program." Paraplegia 12(4): 246-250, February 1975

110. Stone, J.R. et al. "The effectiveness of home care for general hospital patients" Journal of the American Medical Association 205(3): 95, July 15, 1968

111. Taylor, E. "Emergency domiciliary treatment for hemophilia" Lancet 1 (7901): 282, February 1975

112. Taylor, P. and Nelson, B.O. Management Accounting for Hospitals Philadelphia: W.B. Saunders Company, 1964

113. Timbrell, Dennis (Minister of Health, Ontario) Statement made to the Ontario Legislature. November 24,1977 (mimeo)

114. Tolkoff-Rubin, N.E., Fisher, S.L., O'Brien, J.T. et al. "Coordinated Home Care: The Massachusets General Hospital Experience" Medical Care 16(6): 453-464, 1978

115. Torrance, G.W., Thomas,W.H.et al. "A Utility Maximization Model for Evaluation of Health Care Programs" Health Services Research 7: 118-133, Summer, 1972

116. Trager, B. "Providing the right to stay home" Hospitals 49 (20): 93-96, October 1975

117. United States Senate. Home Health Services in the United States Report to the Special Committee on Aging, Washington: U.S. Government Printing Office, 1972

118. van Leunen, M-C. A Handbook for Scholars New York: Alfred A. Knopf, 1978

119. Walton, L: McNairn, N. "Long-Term Home Care ot Institutionalization?" Canadian Family Physician 24: 459-460, May 1978

120. Wartski, S.A. and Green, D.S. "Evaluation in a Home Care Program" Medical Care 9(4): 352-264, 1971

121. Weinstein, M.C. and Stason, W.B. "Foundations of Cost-Effectiveness Analysis for Health and Medical Practices" The New England Journal of Medicine 296(13): 716-21, 1977

122. Widmer, G., Brill, R., Schlosser, A. "Home Health Care: Services and Cost" Nursing Outlook 26(8): 488-493, 1978

123. Wiles, R.M. Scholarly Reporting in the Humanities Toronto: University of Toronto Press, Revised 1970

124. Wills, M. "New directions for home care" Hospital Administration in Canada 14(12):31-36, December, 1972

APPENDIX A

BUDGETARY CONSIDERATIONS

The complete budget request for the overall evaluation study is herein attached. The components that will result from the economic portion will be briefly outlined below.

1. Staff

It is expected that 75% of the Research Assistant time and 30% of the Research Associate time will be devoted to activities related to the economic analysis. This translates into $11,675.00 over the three fiscal periods for the Research Associate, and $17,527.50 for the Research Assistant.

TOTAL: $29,202.50

2. Interviewing

Since the component of the economic related questions in the patient questionnaires is relatively small, all costs here will be considered to be borne by the effectiveness component of the study.

3. Honouraria

These are for the collection of utilization data and are directly related to the economic portion of the study.

TOTAL: $ 2,000.00

4. Equipment Costs

These will be considered to be one half of the costs of the total evaluation study.

TOTAL: $ 721.00

5. Computation and Other Costs

Computation and other costs will be divided equally between the two components of the evaluation.

COMPUTATION	TOTAL:	$ 2,577.50
OTHER	TOTAL:	$ 2,750.00

TOTAL BUDGETARY COSTS OF THE ECONOMIC EVALUATION : $37,251.00

BUDGET FOR OVERALL EVALUATION

ITEMS	No.	% of Time	September 1979-March 1980	April 1980-March 1981	April 1981-August 1981
1. Personnel					
Project Director Research Associate Level 12	1	100% 2 years	$10,773.00	$19,576.08	$ 8,576.54
Research Assistant Level 6	1	100% 2 years	$ 6,468.00	$11,753.28	$ 5,149.27
Nurse Research Assistant	1	100% 7 months	$ 9,133.00	---	---
Medical Advisor	1	1/2 day per week 31 weeks	$ 3,100.00		
Fringe Benefits 15% of Salaries			$ 4,421.10	$ 4,699.40	$ 2,058.87
TOTAL PERSONNEL			$33,895.10	$36,028.76	$15,784.68
2. Interviewing					
Interviewing ($25.00 per interview)			$ 5,600.00	$16,800.00	---
Interviewer Training			$ 320.00	---	---
Coding ($2.00 per questionnaire)			$ 1,344.00	$ 1,344.00	---
TOTAL INTERVIEWING			$ 7,264.00	$18,144.00	---

...continued

BUDGET FOR OVERALL EVALUATION (continued)

ITEMS	September 1979-March 1980	April 1980-March 1981	April 1981-August 1981
3. Honouraria	$ 2,000.00	$ 2,000.00	---
4. Equipment	$ 1,442.00	---	---
1 typewriter @ $932.00 1 desk @ $293.00 1 desk @ $217.00			
5. Travel	$ 200.00	$ 200.00	$ 600.00
6. Printing and Supplies	$ 1,000.00	$ 1,000.00	$ 500.00
7. Publications and Xeroxing	$ 200.00	$ 200.00	$ 500.00
8. Rent and Utility Services	$ 300.00	$ 500.00	$ 300.00
Telephone @ $400.00 per year Postage @ $100.00 per fiscal period			
9. Computation (see separate detail sheet)			
Keypunching and Verifying	$ 600.00	$ 880.00	$ 235.00
Computation, Editing, Archiving	$ 900.00	$ 900.00	$ 1,440.00
TOTAL BUDGET	$47,801.10	$59,852.76	$19,359.68

TOTAL COST OF PROJECT $127,013.54

BUDGET FOR: KEYPUNCHING, VERIFYING, COMPUTATION, DATA EDITING AND ARCHIVING

ITEMS	September 1979-March 1980	April 1980-March 1981	April 1981-August 1981
Questionnaires			
Assessment	400 quest. $300.00 15 hours		
Follow-up (3 mo.)	200 quest. $120.00 6 hours	200 quest. $132.00 6 hours	
Follow-up (12 mo.)		400 quest. $264.00 12 hours	
Daysheets	900 sheets $180.00 9 hours	1800 sheets $396.00 18 hours	500 sheets $121.00 5 hours
Utilization		250 sheets $ 88.00 4 hours	150 sheets $ 66.00 3 hours
Hospital			100 records $ 48.00 2 hours
Keypunch & Verify Total	3100 cards $600.00 30 hours	3600 cards $900.00 40 hours	750 cards $235.00 10 hours
Computer Time:			
Data Editing, Archiving, Analysis	5 hours $900.00	5 hours $900.00	8 hours $1440.00
TOTAL	$1500.00	$1780.00	$1675.00

APPENDIX B

DETAILS OF THE EFFECTIVENESS STUDY

A RANDOMIZED CONTROLLED TRIAL OF THE EFFECTIVENESS OF CHRONIC HOME CARE IN HAMILTON-WENTWORTH FOR PATIENTS AGED 65 AND OVER WITH SPECIFIED DIAGNOSES

I. Abstract of the Proposal

This study is designed to determine the effectiveness of the Hamilton-Wentworth Chronic Home Care programme (C.H.C.) for patients aged 65 and over with specific chronic disease diagnoses as compared to a control group who do not receive C.H.C. Potential benefits to patients include improved quality of life through the ability to remain at home, and the prevention of deterioration. Potential benefits to the health care system include reduced demand on institutional facilities by this group.

Patients in two local acute care hospitals who are 65 and over, with specified chronic diseases, will be assessed prior to discharge by trained nurse-interviewers using standardized rating forms. Those judged eligible for the C.H.C. programme will be assigned to the experimental group (C.H.C.) or the control group (No C.H.C.) at the time of discharge to the community. Assignment will be based on the previous allocation

(to C.H.C. or control groups) of attending physicians. Experimental physicians who agree to participate will be asked to refer all eligible patients to C.H.C. Control physicians who agree to participate in a study of the community service needs of the elderly, will be unaware of their patients' eligibility/ineligibility and patients referred to C.H.C. in this group will be excluded from the control group and followed separately.

Physical function, social function and morale will be measured at initial assessment and then at three months and one year after entry into the study. Follow-up data will also be collected on (a) institutional utilization in acute and chronic hospitals, nursign homes and homes for the aged, (b) physician visits, (c) use of other support services, (d) compliance with therapeutic regimens and (e) the impact of the illness on the caretaker in the home, if applicable.

It is hypothesized that C.H.C. will result in:

1. Improved physical function, social function and morale as compared to the control group.
2. Fewer re-admissions to hospital than among controls.
3. Shorter length of stay in hospital at re-admission than for controls.
4. Fewer patient and/or caretaker problems associated with maintenance in the community than among controls.

This study will be of interest to clinicians and health care planners in Ontario because it will be the first rigourous attempt in the province to quantify the impact of C.H.C. on patients. The randomized controlled trial format is the best design available to establish a link

between the programme (C.H.C.) and any health effects that may accrue (Spitzer et al. 1975). Follow-up of the control group will provide previously unavailable data on patients eligible for C.H.C. but, for various reasons, not admitted to C.H.C.

II. Objectives

The major objectives of the trial are as follows:

1. To measure the effectiveness of C.H.C. with persons aged 65 and over, and discharged from hospital with specified diagnoses in terms of physical function, social function, morale and health services utilization.
2. To compare the effectiveness of the C.H.C. programme to similar health effects in a comparable group of patients who do not receive C.H.C.

III. Detailed Description of Study Design

1) Overview

Since the 65 and over age group represents 72% of the Hamilton-Wentworth C.H.C. patient load and 60% of these patients are admitted to C.H.C. from acute care hospitals, we decided to focus on this group in the study. Inclusion of patients admitted to C.H.C. directly from the community would alter the scope of the study and create difficulties in finding control patients.

All patients aged 65 or over with specified diagnoses at two regional acute care hospitals will be assessed for their eligibility for C.H.C. at discharge. All physicians who practice in family medicine,

internal medicine or surgery and have admitting privileges at St. Joseph's Hospital or the Henderson General Hospital will be randomly selected as C.H.C. physicians or control physicians. Eligible patients will be assigned to experimental (C.H.C.) or control (No C.H.C.) groups depending on the previous random allocation of their attending physician.

For both groups, physical function, social function and morale will be measured at entry and at three months and one year after entry.

2) Research Questions:

Major Questions

(i) Will physical function, social function and morale be better in the C.H.C. group as compared to the control group?

(ii) Will there be fewer re-admissions to hospital during the period of the study among C.H.C. patients than among controls?

(iii) For those re-admitted to institutions during the follow-up period, will their average length of stay be shorter?

Other Questions

(i) Will C.H.C. patients and their caretakers encounter fewer problems associated with maintenance in the community?

(ii) What is the comparative rate of compliance with medical regimens among C.H.C. patients and controls?

(iii) Apart from institutionalization, what other health care and community services resources are used by patients, particularly in the control group?

3) Sample Specification

(i) Sample Size

Sample size has been calculated based on (a) hospital re-admission rate and (b) morale, since these outcomes are ones on which some data are presently available for C.H.C. patients in Hamilton-Wentworth.

(a) The current rate of re-admission to hospital from C.H.C. in Hamilton-Wentworth is 52% at 12 months after entry into the study. We would expect this rate to be maintained in the study and to be 18% less than in the control group. In order to detect this difference, we would need 73 patients in each group to meet the sample size requirements as described by Cochrane and Cox (1957, p. 24) [$\alpha = 0.05$, $\beta = 0.20$, $\delta = 0.18$, 1-tailed test].

(b) In the recent Hamilton-Wentworth study of chronically ill elderly V.O.N. patients (Gibbon 1977), 30% were classified as having 'low' morale at 3 months on the Philadelphia Geriatric Centre Morale Scale. We would expect that C.H.C. patients would attain at least this level and show a difference from the control group of 15%. Therefore we need 94 patients in each group (Cochrane and Cox 1957, p.24) [$\alpha = 0.05$, $\beta = 0.20$, $\delta = 0.15$, 1-tailed test]

(ii) Inclusion and Exclusion Criteria

Patients will be included in the study who (a) are aged 65 and over, (b) have one of the chronic diagnoses listed in Table I, (c) meet the eligibility criteria established for C.H.C. (Appendix D) and (d) are at the point of discharge from either St. Joseph's Hospital or the Henderson General Hospital.

Table I: Diagnoses for Inclusion in the Study

1. Emphysema	10. Chronic Ischaemic Heart Disease
2. Chronic Airways Obstruction	11. Heart Failure
3. Cardiovascular Disease	12. Congestive Heart Failure
4. Cardiovascular Arteriosclerosis	13. Conductive Disorders
5. Cerebrovascular Atherosclerosis and Arteriosclerosis	14. Rheumatoid Arthritis
6. Senility	15. Osteoarthritis
7. Diabetes	16. Degenerative Arthritis
8. Old Myocardial Infarction	17. Lower Limb/Femur Fractures
9. Angina Pectoris	18. Neoplasms

Patients will be excluded from the study if they have been receiving C.H.C. prior to admission to hospital because this may alter how well they do in the programme systematically.

(iii) Pilot Study

In the pilot study conducted using these same inclusion criteria at St. Joseph's Hospital between December 1978 and April 1979, an assessment form delineating the C.H.C. eligibility criteria (Appendix D) was developed. A nurse-research assistant using the form was able to correctly classify patients eligible for C.H.C. 92% of the time when compared to independent assessments of the Home Care Medical Advisor. Of 163 patients assessed over the three month period of the pilot feasibility study, 106 or 65% were eligible for C.H.C. and 57 or 35% were ineligible. Of those discharged and alive at the end of the study who were eligible for C.H.C.(85) 49% were admitted to C.H.C. subsequently and 51% were not. The nurse-research-assistant had no difficulty finding patients and applying the assessment tool.

(iv) Identification and Allocation of Patients

The nurse-research-assistant and the Home Care coordinator will identify and assess all patients at St. Joseph's and Henderson Hospitals who meet the age and diagnostic criteria. In these hospitals, during the patient intake period of the study, final decisions about eligibility will be made by the Medical Advisor to the C.H.C. programme in order to remove the responsibility from the hospital Home Care coordinator who may be under some pressure from hospital colleagues to admit certain patients. Review of the C.H.C. records indicated that these hospitals are representative of the five Hamilton hospitals from which Home Care receives patients, and that the required sample size can be acheived there. However, the intake period can be extended or the project extended to the remaining acute care hospitals if necessary.

Three alternatives for allocation were considered:

(a) Randomize by patient with physicians informed of the eligibility of patients in both the treatment and control groups.

While this alternative has the advantage of providing the highest probability of comparable groups of patients, contamination (possible change in physician behaviour toward controls) is a major concern. Patients for whom the physician may not have considered C.H.C. are identified to him as eligible. As a result, he is likely to either monitor them more closely or refer directly to the V.O.N., Meals-on-Wheels and the like. These are actions that he might not have taken had these patients not been identified as eligible.

(b) Randomize by patient with physician informed about patients in the experimental group, but not informed about the eligibility of patients in the control group

Problems here are that the physician is likely to become aware of the control patients and alter his behaviour as described and he/she may become less cooperative with the study because of feeling less than fully participant. Even if this does not occur, the physician may still alter his behaviour to all his patients in the age group once the experimental patients begin to receive Home Care.

(c) Randomize by physician into treatment and control groups

All family physicians, internists and surgeons in Hamilton who admit to the hospitals used for entry, stratified by (a) year of graduation (in 5 year blocks) (b) membership in the College of Family Practitioners of Ontario(where applicable) (c) specialty (d) location of practice (East or West end Hamilton) and (e) high or low user of C.H.C. prior to the study will be randomly allocated to treatment or control group. At present, 6% of physicians in Hamilton-Wentworth admit to C.H.C. at a rate of 1 or more patients per month over a year (high users) and the rest admit less over a year (low users). Eligible patients will be assigned to C.H.C. depending on the randomized group in which their attending physician belongs. The family doctor will be the attending physician for C.H.C. unless the patient does not have a family doctor. Experimental physicians will be asked to refer all eligible patients to C.H.C.. Control group physicians and their patients will be asked to participate in a follow-up study to determine the needs of the chronically ill elderly in the community without reference to C.H.C. Physicians will

only be asked to participate in the follow-up as their patients become available. Since this strategy (a) minimizes the probability of contamination by physicians having both C.H.C. and control patients and (b) removes the ethical problem of withholding a service which is available and to which the government has committed itself in the recent throne speech (Spring 1979), it is the strategy of choice at this time.

(v) Comparability and Maintenance of the Control Group

This allocation procedure deviates from most clinical trials. There is an underlying assumption in the selected randomization strategy that all physicians are aware of C.H.C. and its criteria, and that those who do not use it choose not to for therapeutic reasons or other reasons not related to awareness of the programme. C.H.C. records reveal that only 6% of 351 physicians who used C.H.C. in the past year admitted 12 or more patients over the year, while 94% admitted less, usually in the order of 1 to 6 patients. Thus, the majority of physicians in Hamilton-Wentworth would not otherwise use C.H.C. during the brief period of the study proposed here.

The control group will be monitored closely for drop-outs to C.H.C. and these will be replaced if necessary in order to meet sample size requirements. Initial intake will be larger than specified by the sample size requirements and there are enough patients available to either extend the intake period or extend intake to other hospitals.

Erosion of the control group may occur (1) if some physicians are truly unaware of C.H.C. but become aware during the study and begin

referring patients to C.H.C. and (2) if control patients become aware of C.H.C. during the study and demand referral. Since there are purposefully no restrictions built into the design to curb referrals of control subjects to C.H.C., the control group could shrink for these reasons. These referrals of control patients to C.H.C. during the study may introduce a selectivity bias and systematically change the control group, making it not comparable to the experimental group. Control patients who do not receive C.H.C. will be compared to those control patients referred to C.H.C. to see if they differ systematically.

Because most of the C.H.C. services (e.g. visiting nursing, meals on wheels) can be purchased independently by the patient and his family, some control patients may receive services yet not be referred to C.H.C. The usual process of referrals of control patients in the community will be monitored closely throughout the follow-up period and costs will be measured. In the analysis, control patients referred to C.H.C. will be matched to experimental subjects on several factors: severity of physical limitations, living arrangements, number of services needed at entry and whether their physician is a high or low user of C.H.C. These two groups will be compared, in addition to the main analysis, to see if outcomes differ.

(vi) Sample Acquisition and Flow of Patients

Approximately 620 physicians will be available for randomization. We expect that 15% will refuse to participate in the study when approached at the time the patient is judged eligible. Should this figure be larger the sample acquisition period will be extended to meet sample size

requirements. We expect that approximately 100 patients will be available per month at the two hospitals based on a review of discharge records. In order to allow for possible fluctuations in these figures, 6 months have been allowed for sample acquisition after one month of start-up at the beginning of the study to permit training of assessors.

After 706 patients have been assessed (353 of experimental physicians and 353 of control physicians) there will be a 15% refusal to participate in C.H.C. or follow-up. Refusals may come from physicians or patients. Of the 600 patients entered left, 65% will be eligible for C.H.C. In the C.H.C. group, all 200 of these will be entered into the programme (experimental group) (A). In the Non-C.H.C. group, it is expected that 50% will be referred to C.H.C., leaving 100 in the control group (B) and 100 in the Non-C.H.C. group who were referred (C).

All patients in all three groups will be followed for 12 months with assessment interviews at 3 months and 12 months after entry into the study.

4) The Experimental Manoeuvre

Experimental (C.H.C.) patients will receive the usual services provided by C.H.C. (see Appendix D). The randomization process should equalize (between experimental and control groups) any factors external to the manoeuvre (e.g. severity of handicap, age, living arrangements) which might confound the results.

Co-intervention is unlikely in most areas of C.H.C. services, since there is no upper limit on the number of additional services allowed each C.H.C. patient except home-making. However, family and

others may substitute for or enhance some services, particularly homemaking services. This will be monitored.

5) Outcome Specification and Measurement

(i) Physical and Social Function

The physical function and social function sections of the Index of Health Questionnaire (Sackett et al. 1977, Chambers et al. 1976) will be used to obtain C.H.C. and control patient determinations at the time of discharge from hospital and after three and twelve months follow-up. Based on a study of randomly selected patients in a family practice, the physical function and social function sections include those questions which best predicted the assessments of their family physician and their assessments of their own health based on the question: "In general, how would you say your health is these days?" In a follow-up study of 70 patients discharged from an acute care hospital, the questions were shown to be sensitive to changes in social function and physical function (Chambers et al. 1976).

In a study of 65 ambulatory out-patients in a rehabilitation centre, responses to the Index of Health Questionnaire physical function items agreed (0.83 Chicetti) to assessments of an occupational therapist and a psychiatrist. Re-test reliability between administration of the physical function questions was 0.80 (Chicetti) (Fortin et al. 1977). In a survey of 122 persons in senior citizens apartments internal consistency reliability estimates of 0.86 for the Index of Physical Function and 0.56 for the Index of Social Function have been reported (Pickard 1978).

A number of investigations of the validity and reliability of the Indexes which are currently under way will provide further information regarding the refinement of the Indexes for use in the present proposal.

(ii) Morale

The Philadelphia Geriatric Centre Morale Scale (Lawton 1972) was originally developed to fill a need for a measure which was multi-dimensional and which was applicable to the very old. Lawton administered the scale to residents in one senior citizen's apartment complex and one home for the aged. The ratings correlated (r = .57) with the rankings of a nurse and a psychologist. Split-half reliability was r = .74. The Kuder-Richardson-21 coefficient of internal consistency was 0.81. Test-retest reliability scores were 0.91 and 0.80 for the two groups. Mean ages were 77.9 and 78.8. Factor analysis produced 6 factors.

Further studies with populations at a rehabilitation centre for the aged (n = 269), applicants to a low income housing project for the aged (n = 406) and tenants in various low-income units (n = 828) (Morris and Sherwood 1975, Lawton 1975) reproduced three of the original factors: Attitude to Own Aging (Life Progression), Agitation (Tranquility) and Loneliness/Dissatisfaction. Internal consistency in these sub-scales as determined by Cronbach's alpha was 0.81, 0.85 and 0.85 respectively. Mean ages of the groups ranged from 69 to 74.5.

The revised P.G.C. Morale Scale contains 17 items and all responses are dichotomous. Each item is scored as "1" or "0" with "1" indicating a "high morale" response. The recent study of elderly V.O.N. patients (Gibbon 1977) found that the Attitude to Own Aging scale and

the Loneliness/Dissatisfaction scale correlated with the physican's rating of depression, although only slightly (r = .30)

(iii) Data Collection Strategies

(a) Initial Assessment Interviews will be conducted by the nurse-research-assistant and the hospital-based Home Care coordinator. The instrument has been tested in the pilot feasibility study. During the start-up phase of the main study, the two raters in each hospital will pre-test the instrument again to check for inter-rater reliability and ease of administration.

(b) Outcome Assessment Interview will be randomly assigned to four lay interviewers. Interviewers will be trained for 2 weeks prior to outcome assessment in order to minimize as much as possible inter-viewer related sources of error such as low response rates, intrusion of unwanted interviewer influence and carelessness in reading instructions and recording responses. This will include pre-testing of the instrument. The interviewers will not be part of the regular study staff and will not be informed of whether or not the patient is in the C.H.C. group or the control group. The first-editing of the questionnaires will be done by the interviewers. Interview results will be checked for completeness beofre payment is made thus building in a quality control element.

(iv) Coding

All coding manuals will be developed by the study staff. All assessment questionnaires and outcome questionnaires will be edited a second time and coded for the computer by 4 editor-coders, again trained on the job and uninvolved otherwise in the study.

(v) Other Data

Prior to outcome assessment, brief questionnaires will be developed to measure (a) patient compliance with medical regimens and (b) the reaction of the family/caretaker to the patient's illness and care in the home. Since all eligible patients require some assistance from family or friends in the home, there should be some such person available for each study subject. Compliance will be measured additionally by pill count.

8) Outcome Analysis

A. Overview

i) Group B (100 Non C.H.C. control patients) and Group C (100 patients allocated as controls but referred to C.H.C.) will be compared to detect any systematic differences in terms of severity of physical limitations, living arrangements, number of services needed at entry, age, sex and whether their physician is a high or low user of C.H.C. Comparisons between dichotomous variables such as sex or physician status (high/low users) will use a test of the difference between two proportions using the normal approximation to the binomial distribution (Colton 1974). Comparisons between variables with a number of categories such as age (in 5 year blocks) or number of services needed will be made using a Chi-square Goodness of Fit test (Maxwell 1961).

ii) Group A (200 experimental C.H.C. patients) will be compared with Group B in terms of the outcomes of interest (see Section B below).

iii) Outcomes in Group B will be compared to outcomes in one-half of Group A matched on severity of physical limitations, living arrangements, number of services needed at entry, age, sex and whether or not

the attending physician is a high or low user of C.H.C.

iv) Outcomes in Group C will be compared to outcomes in one-half of Group A similarly matched.

B. Analytic Strategies

i) Overall Comparisons

a) For hospital re-admissions a Chi-Square test of independence will be done on the two-by-two table.

b) For the length of time between hospital discharge and re-admission, a t-test for the difference between independent means will be performed.

c) Scores for each patient (at 3 months and 12 months follow-up) in physical function, social function and morale will be classified in two ways: first as good, fair or poor function and second as improved, no change or deteriorated since entry into the study. These scores will then be compared between groups using a Chis-Square test of independence for two-by-three tables.

ii) Before-After Scores

In order to assess change over the period of the study for each group in relation to the functional outcomes, entry and outcome scores will be compared using Bowker's Chi-Square test for correlated contingency tables.

iii) Comparison among Disease Categories

The 18 diagnoses outlined in Table I will be collapsed to 5 categories (Heart Disease, Cerebro-Vascular Accidents, Arthritis, Cancer and Other) in order to compare health outcomes. The pilot study

has shown that these are the most common categories. Any attempt to look at all 18 diagnoses would most likely result in cell frequencies too small to be meaningful.

REFERENCES

1. Chambers, L.W., Sackett, D.L., MacPherson, A.S. The Development and Application of Indexes of Health: Methodologic Documentation and Report of the First Generation of Investigations St. John's, Newfoundland: Memorial University 1976

2. Cochrane, W.E. and Cox, G.M. Experimental Designs New York: John Wiley and Sons, 1957

3. Colton, T. Statistics in Medicine Boston: Little, Brown & Co. 1974

4. Fortin, F. and Kerouac, S. "Validation of Questionnaires on Physical Function" Nursing Research 26: 128-135, 1977

5. Gibbon, M. and Stevens, E. "Nurse Influence on the Quality of Life of Elderly Patients" National Health and Welfare Project # 606-1255-44, November 1977

6. Lawton, M.P. "The Dimensions of Morale" in D. Kent, R. Kastenbaum and S. Sherwood (eds) Research, Planning and Action for the Elderly New York: Behavioural Publications, 1972

7. Lawton, M.P. "The Philadelphia Geriatric Centre Morale Scale: A Revision" Journal of Gerontology 30(1): 85-89, 1975

8. Maxwell, A.E. Analyzing Qualitative Data London: Chapman and Hall, 1961

9. Morris, J.N. and Sherwood, S. "A Retesting and Modification of the Philadelphia Geriatric Centre Morale Scale" Journal of Gerontology 30 (1): 77-84, 1975

10. Pickard, L. Personal Communication, University of British Columbia Vancouver: 1978

11. Sackett, D.L., et al. "The Developemnt and Application of Indexes of Health: General Methods and a Summary of Results" American Journal of Public Health 67: 423-428, 1977

12. Spitzer, W.O., Feinstein,A.R. and Sackett, D.L. "What is a Health Care Trial?" Journal of the American Medical Association 233(2): 161-163, July 1975

APPENDIX C

METHODOLOGIC CONSIDERATIONS IN THE ECONOMIC EVALUATION OF THE OVERALL IMPACT OF THE HOME CARE PROGRAMME ON THE REGIONAL HEALTH SERVICES

Many of the literature reports of home care attempt to evaluate the overall impact of such programmes on the costs of health services throughout the entire system (often implicitly rather than explicitly) and the study described in this thesis does not address this question. While the limitations of the interpretation of results within the randomized trial described are well outlined in the main thesis, the importance of the question of the overall impact of home care merits mention here. This brief appendix is designed to point out some of the major methodologic issues which would have to be addressed in a study of the overall impact of the programme from an economic point of view and to highlight the difficulty of such a study and the danger of interpreting more limited results in terms of this larger framework.

Problems with Currently Published Studies

As is mentioned in the thesis, several authors advocate home care as a cost-saving alternative form of care by comparing per diem rates between home care and institutionalization. One problem with this is that the per diem rate, which is merely the net operating expenditures of the institution divided by the number of patient days over the same time period, does not reflect the real resource use for a day of a particular

type of patient service. As discussed in the thesis, a method such as the step-down cost allocation technique is a much more accurate estimate of the resources used up by patient services of previously defined types.

Another problem is that comparison of per diem rates in the two alternatives of home care versus hospitalization assumes that health effects in the two are at least equal. Moreover, it assumes that all patients who would have received home care (in the no programme case) are in hospital for the same length of time that they would have been on home care, and that hospital beds not used up by home care patients are eliminated from the system and no longer generate resource use. In order to evaluate the impact of the home care programme on the health care system (and hence whether it is cost-saving), these various assumptions must be challenged and reasonable estimates must be made about the 'states of the world' before and after implementation of the home care programme.

The type of evaluation envisioned here would be carried out from the viewpoint of the Ministry of Health since the issue is whether or not the home care programme saves health care expenditures overall. The implicit assumptions must be made explicit by detailed description of the alternatives of home care and no home care in terms of health service utilization.

Description of Programmes

Since the Hamilton-Wentworth Home Care programme serves the population located in the Regional Municipality of Hamilton-Wentworth it is appropriate that health service utilization be examined on a

regional basis as well. Given that the home care programme is now in operation, the 'state of the world' without home care would have to be estimated based on determinations of what the regional utilizations would be like today if the home care programme were not in place.

The description of health service utilization in the region without home care must approximate what the situation would be in the same year as that in which utilization is measured with home care. Hence, predictions must be made on the basis of trends in health service utilization and population patterns before the inception of the home care programme. The description should include estimates of what the bed capacities of the regional institutions would be during the study year, what the diagnostic and age mix would be in each institution and what the budgets would be. Lengths of stay in particular types of care would be estimated. Trends in ambulatory care would also have to be examined in order to estimate use of these services and compare them to the comparable services with the home care programme in place. All aspects of health service utilization both in institutions and community agencies might be effected by the presence or absence of a home care programme, allowing for the fact that the potential home care patient in the 'no programme' situation may or may not be in hospital.

Trend data will be partially available from the Ministry of Health but may need to be determined as well from looking at patterns over time (probably several years) before the inception of the home care programme. Once these trend data are available, a detailed description of the "no programme' situation can be developed.

Similar characteristics of the current system with home care

would have to be developed. If the chronic patient is the one of interest, then the chronic care sector may be the one of focus for this description but this assumes that there is no spill-over effect of home care in other sectors, and this may not be so. For example, if fewer patients with chronic diseases are using facilities, these may be used by more acutely ill patients. It is therefore more complete to compare the total home care programme to all health service utilization in the region, and then look at the component parts of home care.

Budget estimation for the 'no programme' situation would be based on applying the estimated utilization patterns and case mix to budgetary rates and developing a hypothetical budget for each institution and agency.

Cost Measurement

Measurement of costs in the two alternative programmes could be done in the way described in this thesis for hospital costs and in the home care programme itself. Current costs for ambulatory care could be measured using per-case rates for clinics (developed by a step-down method if hospital clinics) or for other services, including physician services. These rates can then be applied to the estimated ambulatory care patterns for the no home care situation and the actual patterns for home care.

Costs can be summarized in terms of the total institutional costs plus ambulatory care costs plus home care costs on the one hand, and total institutional costs and ambulatory care costs on the other.

Specific Methodologic Issues

The several methodologic problems mentioned earlier in relation to the assumptions implied in the comparison of per diem rates can be overcome by an approach such as that described above and with careful attention to cost measurement. Each of the specific issues will be discussed in turn below.

1. Per Diem Rates as Inaccurate Estimates of Patient Care Costs

The step-down allocation procedure described in this thesis for determining costs per day of patient care, while still an estimate, can remove those aspects of hospital costs which are irrelevant to the service to patients and the resultant average fully allocated cost can be specific to patients classified by diagnosis or type of care. Apart from direct observation of a large number of different patient-types over time to determine all the ingredients of their care, this is the most accurate method of costing institutional care. It is important for an analysis such as this to be able to compare home care patients of different types with similar patients in the no home care situation in terms of health care costs as accurately as possible.

2. Home Care Days versus Institutional Days

While it may be expected that home care programmes will replace institutional care for most individual patients, it does not follow that institutional costs are saved since other patients may use the beds that would have been used by home care patients. These new patients may be

as costly to the health care system as the home care patients would have been and may in fact use up more resources if they are sicker. Moreover, unless the beds are eliminated from the system, they will generate costs even if empty because of the costs of the buildings and their maintenance.

The characteristics of the home care patients are such that many of them, if in hospital instead of on home care, would generate fewer costs than an acutely ill patient. In other words, patients who are kept in hospital because of lack of facilities for care at home are most likely to be using the minimal facilities of the hospital service rather than many expensive diagnostic and surgical services. Patients who are unable to maintain function at home due to a lack of home care, however, are likely to consume any and all hospital resources at re-admission because they may be sicker at these times and require acute and emergency care. While some hospital beds will not be used by home care patients, then, these beds may be used by a variety of other patients who may or may not generate more costs. In addition, there may be patients maintained at home because of the programme who do not re-use hospital services as often or who do not use them at all and who differ from the no home care patients in their use of other ambulatory services. Hence, the entire system must be examined in terms of utilization with and without the home care programme.

Patterns of care for patients with similar diagnoses and age in the home care and no home care situations must be measured in order to determine whether or not the length of stay on home care plus hospital is equal to the length of stay in hospital for patients without home care. Similarly, overall patterns of utilization for both situations must be

measured and costed to account for the fact that utilization may differ as a result of home care treatment rather than as a result of reduced length of hospital stay prior to entry into the programme, and that these differences may be reflected in all areas of health service utilization rather than in institutions alone. The detailed programme description in the two alternatives and related costing eliminates the need to make assumptions about the patterns of utilization without home care.

3. Beds Not Used by Home Care Patients

Again, the issue of whether or not beds unused by home care patients are used by others is accounted for in the programme description and costing measures described. As mentioned above, only a complete review of overall utilization can challenge the assumption that beds not used by home care patients are then not generating health service costs.

4. Assumed Equal Health Effects

Comparing the costs between the two alternatives and assuming equal health effects is a somewhat naive, but less difficult, approach to home care evaluation. Without sound evidence to confirm this assumption, it must be challenged by measuring effects in some way and weighing these against the incremental costs of home care. For example, morbidity patterns can be used, allowing that these data are hard to get at and may not accurately reflect output of home care programmes, particularly with the chsonically ill. Patterns of utilization and morbidity within each alternative should provide information about the number of people who receive service (either hospital, home or ambulatory) that they would

not receive in the other alternative and these may provide the best estimate of health effects. In this sense, the assumption would be made that some care produces positive outcomes as opposed to no care which does not. Then increases in care given in each sector can be called health effects. In this situation, the cost associated with that care is ignored and the care itself is counted as an effect. If, for example, the beds not used by home care patients are filled by acute treatment patients who would otherwise have not been treated or treated in an ambulatory setting, then costs are increased and possibly health effects are increased as well. However, without directly measuring effects or without clear research evidence, a case can be made that institutionalization in these patients results in unchanged or reduced health effects.

For the question of interest here,namely whether or not home care saves health care dollars, it is most reasonable to assume equal health effects and conduct the study as a cost-minimization one. Cost-effectiveness can only be carried out if health effects from all treatments can be measured with some reasonable accuracy, perhaps with detailed morbidity surveys.

Summary

In summary, the overall impact of the home care programme can be evaluated in a study which allows for all contingencies in relation to the resource use by the programme and the resources freed up by the programme. Such a study would be a complex one to devise and implement, but would provide needed information about this issue.

APPENDIX D

DESCRIPTION OF HOME CARE: ELIGIBILITY, REFERRAL AND ORGANIZATION

1. Criteria for Admission to the Pilot Project in Long Term Chronic Home Care per: King, Dr. R.M. Ontario Ministry of Health 25 September 1975

A. Eligibility Criteria

(a) The patient's medical condition is such that the provision of professional treatment will:

(i) tend to maintain a stabilized condition, that is prevent deterioration, or

(ii) delay deterioration into a state requiring an institutional level of care.

(b) Criterion Service i.e. Professional Health Service

It is necessary to clearly identify the programme as a health programme by requiring at least one of the health professional services (for example:nursing, physiotherapy, occupational therapy or speech therapy). Lack of need for at least one of these four services automatically disqualifies the patient for Home Care.

(c) Active Treatment versus Health Supervision

A decision may be required from time to time between health

supervision and Home Care professional treatment as it applies to the criterion services. To resolve this question, a patient will be considered as receiving professional treatment in Home Care if he is receiving three or more visits of the same criterion service per month on a regular basis, that is three nursing visits or three physiotherapy visits and so on.

The criteria for eligibility above are in addition to the previously established criteria for short-term active treatment Home Care, namely:

(d) The patient is insured under the Ontario Health Insurance Plan.

(e) The patient is under the medical supervision of an attending physician.

(f) The patient's medical condition is such that he can be treated adequately at home with the services available through the Home Care programme.

(g) The patient's needs cannot be met on an out-patient basis.

(h) The patient is in need of at least one of the professional services such as nursing, physiotherapy, occupational therapy and speech therapy. (Homemaking service does not qualify in the category of a professional service).

(i) The home is suitable to enable the required care to be given.

(j) The patient's family and/or other appropriate persons are willing and able to participate in the programme where and when required.

(k) The patient resides in the area designated as being covered by the Home Care programme.

2. Steps in Using Home Care

(a) Admission to Home Care is possible from home (through the doctor's office) or hospital (24 hour notice if possible). Home Care services are also available for residents in Nursing Homes and Homes for the Aged.

(b) Referral: (i) From physician's office with a medical referral form. Interim service can be established pending receipt of written instructions.

(ii) From hospital by contacting the Home Care coordinator or completing the referral form.

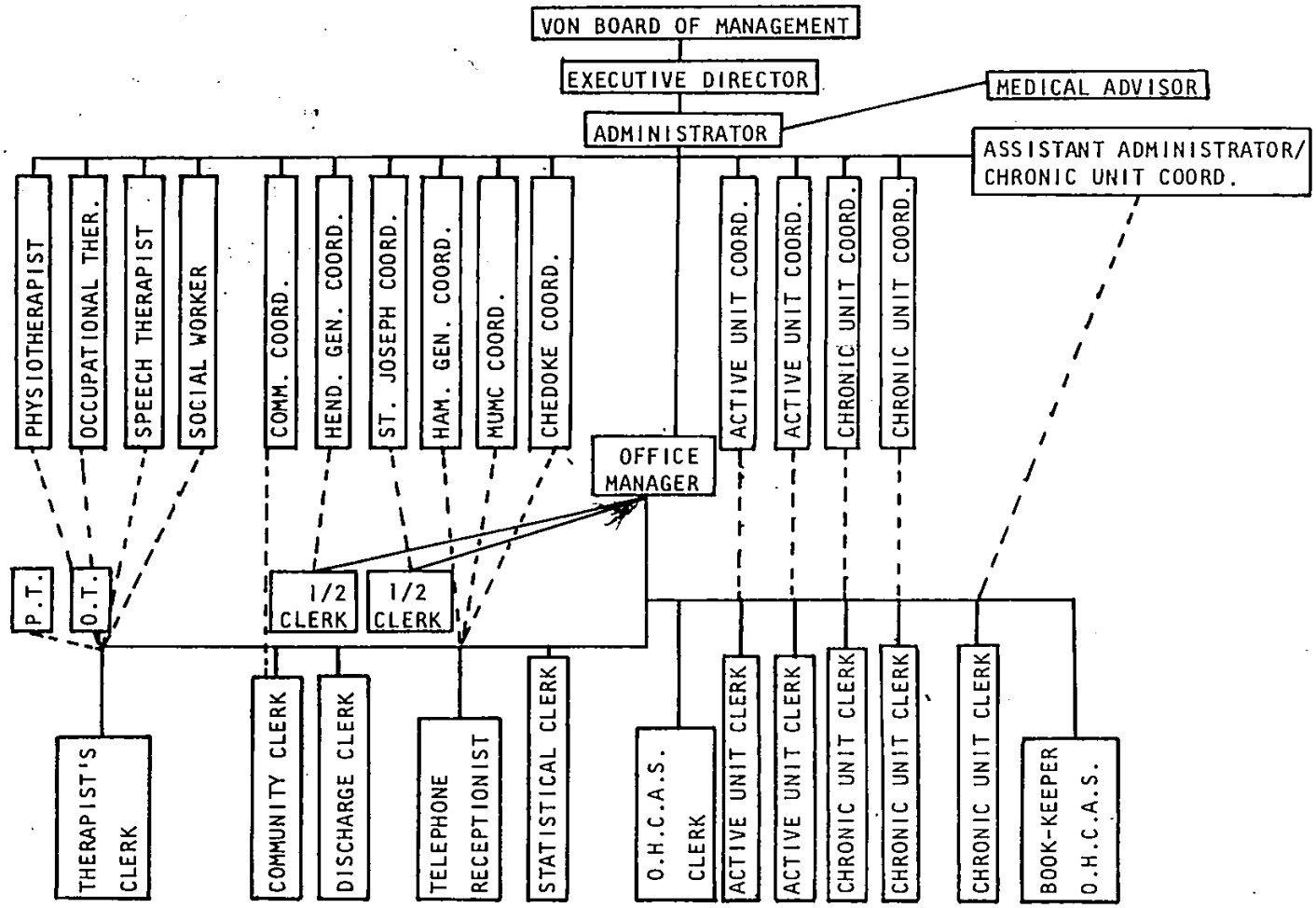
(c) Evaluation by Home Care team is necessary for admissibility.

(d) A temporary Drug Card may be issued for drugs covered by the Ontario Drug Benefit Plan.

3. Services Provided by Home Care

(a)	Nursing Visits	(h)	Friendly Visitors
(b)	Physiotherapy	(i)	Dressings
(c)	Occupational Therapy	(j)	Equipment
(d)	Speech Therapy	(k)	Medications
(e)	Homemaking	(l)	Transportation
(f)	Meals-on-Wheels	(m)	Laboratory and X-ray Services
(g)	Social Work		

4. ORGANIZATIONAL CHART FOR HAMILTON-WENTWORTH HOME CARE PROGRAMME



APPENDIX E

QUESTIONNAIRES FOR ASSESSMENT OF ELIGIBILITY AND HEALTH OUTCOMES

This appendix contains the initial assessment questionnaire to be used in determining the patient's eligibility for Home Care (pages 232-239). Also included is the questionnaire that will be used to measure physical function, social function and morale at entry into the study, 3 months and 12 months follow-up (pages 240-248).

Initial Assessment Questionnaire

I.D. # _____

I. DEMOGRAPHIC DATA (from patient's chart)

NAME: _____

ADDRESS: _____

PHONE: _____

DATE OF BIRTH: ____ ____ ____ (DAY MONTH YEAR)

OHIP ☐☐☐☐☐☐☐☐

SEX: M ☐ F ☐

AGE: _____

MARITAL STATUS: _____

NEXT OF KIN: _____ (NAME) _____ (RELATIONSHIP)

PHONE FOR NEXT OF KIN: _____

ATTENDING PHYSICIAN: _____

FAMILY PHYSICIAN: _____

DATE OF ADMISSION TO HOSPITAL: _____

DIAGNOSES	DIAGNOSIS FOUND ON CHART	DIAGNOSIS FOUND ON KARDEX
1.		
2.		
3.		
4.		
5.		
6.		

DATE OF INTERVIEW: _____

WAS PATIENT INTERVIEWED? ☐ YES ☐ NO → REASON: _____

WAS FAMILY INTERVIEWED? ☐ YES ☐ NO

DATE OF UPDATE: _____

NOTES: (re broken interview, repeat visits) _____

II. PATIENT CHART HEALTH STATUS INFORMATION

1. PROBLEMS

Check whether problem listed on	Chart	Kardex
1.		
2.		
3.		
4.		
5.		

2. TREATMENT OTHER THAN MEDICATIONS (diabetic teaching, colostomy etc.)

	Chart	Kardex
1.		
2.		
3.		
4.		
5.		

3. MEDICATIONS

	Chart	Kardex
1.		
2.		
3.		
4.		
5.		
6.		

4. DIETARY REQUIREMENTS	Chart	Kardex

	YES	NO
5. REFERRAL TO SPEECH THERAPY WHILE IN HOSPITAL	☐	☐
6. REFERRAL TO OCCUPATIONAL THERAPY WHILE IN HOSPITAL	☐	☐
7. REFERRAL TO PHYSICAL THERAPY WHILE IN HOSPITAL	☐	☐
8. REFERRAL TO SOCIAL WORK WHILE IN HOSPITAL	☐	☐

9. ACTIVITY LEVEL:

- Walking unaided ☐
  - with mechanical aid ☐
  - with human aid ☐
- Wheelchair independent ☐
  - dependent ☐
- Total bed care ☐

ACTIVITY DATA OBTAINED FROM: ☐ CHART ☐ KARDEX ☐ PROFESSIONAL

III. CLINICAL ASSESSMENT OF NEED FOR HOME CARE SERVICES

We are doing a study of people over 65 who have been sick in hospital. Your doctor agrees that we may talk to you. Is that alright with you? Anything you say will be held in strict confidence. The information you give us is very important and it should help us plan better for others. We would appreciate your help. Will you help us?

Your replies will be kept confidential. We would like to ask you some questions about your health and how you manage at home.

1. First, do you live alone?

   ☐ *YES*

   ☐ *NO* → 1a. Who lives at home with you? _____

2. Have you moved in the last year?

   ☐ *NO*

   ☐ *YES* → Was that within the last six months or less?

   ☐ *NO*

   ☐ *YES*

3. Have there been any other changes in your living arrangements in the past year - for example, other people moving in or out, or any changes made to your home?

   _____

   _____

   _____

4. Is your home:

   - a house? ☐ — 4a. Is the house a: 1 storey ☐ / 2 storey ☐ / split level ☐
   - a senior citizen's apartment? ☐
   - an apartment that is not a senior citizen's apartment ? ☐
   - a room ? ☐
   - a lodging house? ☐
   - some other type of dwelling? ☐ → specify: _____

5. When you leave the hospital will it be to _____?
   (type of dwelling)

   ☐ *YES*

   ☐ *NO* What type of place will you go to? _____

   If unclear ask:

   Is that in Hamilton-Wentworth region? ☐ *YES* ☐ *NO* → *Discontinue Interview!*

   ☐ *Don't know*

6. If you require assistance from another person, is there someone to help?

☐ *YES*

☐ *NO* → *GO TO Q 10*

7. Who is that? _____ RELATIONSHIP

8. Is that person able to help you
   - ☐ all the time, or
   - ☐ only part of the time?

9. Is there someone available both day and night?
   - ☐ *Yes, both day and night*
   - ☐ *Only during the day*
   - ☐ *Only during the night*

10. Have you or your family ever had any of the following services at home?

What about ...
- ☐ 1. Victorian Order of Nurses
- ☐ 2. St. Elizabeth Nursing Service
- ☐ 3. Public Health Nursing Service
- ☐ 4. a Homemaker
- ☐ 5. Helping Hands
- ☐ 6. Meals on Wheels, or
- ☐ 7. Any other service?

What service was that? _____

_____

**** IF PATIENT IS CONFUSED, ASK QUESTIONS 11 & 12 OF THE HEAD NURSE AND CHECK-OFF THE "ANSWERED BY NURSE" BOX*

11. Do you think you will have any difficulties managing at home/at the place you are going to?

☐ *NO* → *Go to closing statement!*

☐ *YES* *Verbatim Comments* _____

_____

_____

Answered by Nurse ☐

12. Do you anticipate any problems in the following areas:

	YES	NO	DON'T KNOW	NOT APPLICABLE
1. getting dressed	( )	( )	( )	( )
2. getting around your home/ the place to which you are going	( )	( )	( )	( )
3. looking after taking your medication	( )	( )	( )	( )
4. carrying out any treatment you may need	( )	( )	( )	( )
5. using any aids you may need such as crutches, a brace, walker, cane or other aid	( )	( )	( )	( )
6. preparing meals	( )	( )	( )	( )
7. shopping	( )	( )	( )	( )
8. laundry	( )	( )	( )	( )
9. cleaning	( )	( )	( )	( )
10. getting to the bathroom	( )	( )	( )	( )
11. bathing	( )	( )	( )	( )
12. any other problems	( )	( )	( )	( )

Answered by Nurse ☐

Thank you very much for your help in answering these questions.

END OF PATIENT QUESTIONNAIRE

Assessment of patient's mental status:

☐ *Confused* ☐ *Not Confused*

IV. DECISION TO ENROLL IN HOME CARE

1. Can any of the patient's needs be met in an Outpatient Department?(e.g. O.T., P.T., Speech Therapy)

☐ YES → 1a: Which needs? _____

☐ NO

☐ NOT APPLICABLE (no needs)

2. Are the patient's family or friends willing and able to participate in the programme where and when required?

☐ YES

☐ NO → 2a. Why not? _____

_____

_____

3. I feel this patient will require the following services at home after discharge from hospital.

	NO	YES	FREQUENCY
Nursing - General Nursing Care	☐	☐	_____
- Special treatment _____ specify	☐	☐	_____
- Monitoring & Supervision _____ specify	☐	☐	_____
Physiotherapy	☐	☐	
Occupational Therapy	☐	☐	
Speech Therapy	☐	☐	
Social Work	☐	☐	
Nutritionist	☐	☐	
Homemaker	☐	☐	
Meals on Wheels	☐	☐	
Requires Drugs	☐	☐	
Special Equipment Procured for Home	☐	☐	
Provision of Dressings	☐	☐	
Laboratory	☐	☐	
X-ray	☐	☐	
Transportation	☐	☐	
Other _____ specify	☐	☐	

4. Is the patient's professional treatment reasonably expected to result in one of the following:

YES	NO	
☐	☐	a) progress toward established goals
☐	☐	b) delay or prevent deterioration of medical condition
☐	☐	c) delay or prevent transfer to an institutional mode of care/provision of care at home while awaiting placement

5. These judgements were based on:

	YES	NO
Review of Patient's Hospital Chart	☐	☐
Review of Patient's Responses to Health Status Questionnaire	☐	☐
Direct Observation of Patient	☐	☐
Discussion with Family Member	☐	☐
Other _____ (specify)	☐	☐

6. Your confidence in this assessment (check one)

No confidence — Very confident

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) 6 ( ) 7

7. Position of clinician making assessment

Home Care Coordinator ☐
Nurse Research Assistant ☐
Medical Advisor to Home Care ☐

8. Return Visit before Discharge indicated ☐ YES ☐ NO

9. On the basis of the above is the patient ☐ eligible for Home Care?
☐ not eligible for Home Care?

10. Update: Date _____

Eligible ☐
Not Eligible ☐

Patient Outcome Questionnaire

I.D. # _____

Hello, my name is _____. You will remember that you were kind enough to say before you left hospital that you would take part in this study of the health needs of older people in the community. We appreciate your help. The information you give us is very important and it should help us to plan better care for others.

Your replies to the questionnaire will be kept confidential. We would like to ask you some questions about your health and daily activities.

Now I will ask you about physical activities you do at present.

1. Today, do you or would you have any difficulties at all with:

	Yes	*No*	*Needs Person to Help*	*Needs Mechanical Aids*	*Not Applicable (doesn't do this)*
1) Washing your face and hands	( )	( )	( )	( )	( )
2) Shaving (men)	( )	( )	( )	( )	( )
3) Combing your hair	( )	( )	( )	( )	( )
4) Washing your hair	( )	( )	( )	( )	( )
5) Cutting your toenails	( )	( )	( )	( )	( )
6) Dressing	( )	( )	( )	( )	( )
7) Undressing	( )	( )	( )	( )	( )
8) Bathing	( )	( )	( )	( )	( )
9) Using the bathroom	( )	( )	( )	( )	( )
10) Getting to the toilet on time	( )	( )	( )	( )	( )
11) Preparing meals	( )	( )	( )	( )	( )
12) Shopping	( )	( )	( )	( )	( )
13) Dusting or light housework	( )	( )	( )	( )	( )
14) Cleaning floors	( )	( )	( )	( )	( )
15) Standing up from a chair	( )	( )	( )	( )	( )
16) Sitting down in a chair	( )	( )	( )	( )	( )
17) Walking within a room	( )	( )	( )	( )	( )

continued

1. *continued*

	Yes	No	Needs Person to Help	Needs Mechanical Aids	Not Applicable (does not do this)
18) Walking between rooms	( )	( )	( )	( )	( )
19) Transferring to a Wheelchair	( )	( )	( )	( )	( )
20) Transferring from a Wheelchair	( )	( )	( )	( )	( )
21) Climbing stairs in your home	( )	( )	( )	( )	( )
22) Climbing up 2 flights of stairs	( )	( )	( )	( )	( )
23) Walking as far as a mile	( )	( )	( )	( )	( )
24) Any other activities	( )	( )	( )	( )	( )

_____

specify

Ask for each physical activity with which the respondent has difficulty and record in the chart above, along with:

1a. Do you need help from another person to _____ ?
(state activity)

1b. Do you need any mechanical aids to _____ ?
(state activity)

2. Do you fond that you are unable to do certain kinds or amounts of work or housework that you once did, because of your health?

☐ *YES*
☐ *NO*
☐ *DON'T KNOW*

2a. What type of work or housework is that?

Record in chart below. For each type of housework or work ask:

2b. How long have you been unable to do _____ *(type of work)* because of your health?

Record in chart below

CHART

2a. *Types of work/housework*	2b. *How long unable to do* Less than 1 month	1-3 months	More than 3 months
( ) *Preparing meals*	( )	( )	( )
( ) *Shopping*	( )	( )	( )
( ) *Cleaning - vacuuming*	( )	( )	( )
( ) *- dusting*	( )	( )	( )
( ) *Laundry*	( )	( )	( )
( ) *Bed Making*	( )	( )	( )
( ) *Mending*	( )	( )	( )
( ) *Gardening*	( )	( )	( )
( ) *Minor Household Repairs*	( )	( )	( )
( ) *Major Household Repairs*	( )	( )	( )
( ) *Other* _____ *(specify)*	( )	( )	( )

3. Knowing the way your home is now, do you have any physical difficulty in moving from room to room?

☐ *YES*
☐ *NO*
☐ *DON'T KNOW*

3a. What room or rooms do you have difficulty reaching?

☐ *Bathroom* ☐ *Kitchen* ☐ *Bedroom*

☐ *Other* _____ *(specify)*

Are there rooms in your home that you cannot reach at all?

☐ *YES*
☐ *NO*
☐ *DON'T KNOW*

What room or rooms can you not reach?

☐ *Bathroom* ☐ *Kitchen* ☐ *Bedroom*

☐ *Other* _____ *(specify)*

4. Knowing the way you home is now, do you have any physical difficulty in going outside?

☐ *YES* 4a. What type of difficulty do you have?

☐ *NO* _____

☐ *DON'T KNOW* _____

_____

5. At present, are you able to walk out-of-doors when the weather is good?

☐ *YES* What is the farthest you can walk out-of-doors?

		YES	*NO*
1.	30 feet or less ?	☐	☐
2.	More than 30 feet but less than a mile?	☐	☐
3.	One mile or more?	☐	☐

☐ *NO*

☐ *DON'T KNOW*

6. Do you (or would you) have any physical difficulty travelling by bus whenever necessary?

NO ☐

YES ☐

DON'T KNOW ☐

7. Do you (or would you) have any difficulty at all travelling by car whenever necessary?

NO ☐

YES ☐

DON'T KNOW ☐

8. Have you ever been able to drive a care? *NO* ☐ *Go to Question 10*

YES ☐ 8a. Do you have access to a care now?

NO ☐ *Go to Question 10*

YES ☐

9. Do you have any physical difficulty at all driving a car by yourself?

NO ☐

YES ☐ ⟶ 9a. Is this because of a physical difficulty?

NO ☐

YES ☐

10. Thinking now about your vision...

Do you have any trouble seeing ordinary newsprint?

Would you say:

No, never ☐

No, not if I wear my glasses ☐

Yes, sometimes ☐

Yes, always ☐

11. Do you have a headache after watching television or reading?

Would you say:

No, never ☐

No, not if I wear my glasses ☐

Yes, sometimes ☐

Yes, always ☐

12. Would you say that your vision is <u>excellent</u>, <u>adequate</u>, <u>limited</u>, <u>poor</u>, or <u>very poor</u>?

<u>INTERVIEWER NOTE</u>: Do not read italicized parts. If respondent asks for a definition of a word, read the definition to the right of the word.

( ) 1. Excellent - it never prevents activities

( ) 2. Adequate - sufficient to avoid accidents

( ) 3. Limited - cannot read small print

( ) 4. Poor - inadequate for personal safety

( ) 5. Very Poor - prohibits most activities

( ) 6. *Blind*

( ) 7. *Don't Know*

( ) 8. *No Answer*

13. Thinking now about your hearing ...

Do you have trouble hearing in a normal conversation with several other persons?

- No, never ☐
- No, not if I wear a hearing aid ☐
- Yes, sometimes ☐
- Yes, always ☐

14. Do you have trouble hearing the radio or television?

- No, never ☐
- No, not if I wear a hearing aid ☐
- Yes, sometimes ☐
- Yes, always ☐

15. Can you use the telephone?

- ☐ *Yes*
- ☐ *Yes, with a hearing aid*
- ☐ *No* Why is that?
  - ☐ *No telephone*
  - ☐ *Can't dial*
  - ☐ *Can't hear well enough*
  - ☐ *Other* _____ *(specify)*

16. Would you say that your hearing is excellent, adequate, limited, poor, or very poor?

INTERVIEWER NOTE: Do not read italicized parts. If respondent asks for a definition of a word, read the definition to the right of the word.

( ) 1. excellent - does not prevent activities

( ) 2. adequate - sufficient for personal safety

( ) 3. limited - cannot hear some sounds

( ) 4. poor - TV or radio must be turned up and people must shout

( ) 5. Very poor - difficult to hear even if TV or radio turned up and people shout.

( ) 6. *Deaf*

( ) 7. *Don't Know*

( ) 8. *No Answer*

17. How would you say your health is these days?

Very Good ☐
Pretty Good ☐
Not Too Good ☐

18. Taking all things together, how would you say you are these days? Would you say you are:

Very Happy ☐
Pretty Happy ☐
Not Too Happy ☐

19. In general, how satisfying do you find the way you're spending your life these days? Would you call it:

Completely Satisfying ☐
Pretty Satisfying ☐
Not Very Satisfying ☐

20. Are you presently working in a job?

☐ Yes

☐ No → Are you presently on vacation or on sick leave from a job?

☐ Yes

☐ No → Are you either:

retired from work ☐
a student ☐
a housewife ☐
other ☐

_____
(specify)

21. How much time, in a one week period, do you usually spend watching television?

None ☐
Less than three hours a week ☐
Less than one hour a day ☐
More than two hours a day ☐

22. Which of the following describe your usual social and recreational activities?

	No	Yes
(a) going to church	☐	☐
(b) going to a movie	☐	☐
(c) going to a relative's home	☐	☐
(d) other activities:	☐	☐

_____ (specify)

23. Has anyone visited you in the last week?

	No	Yes
(a) a relative	☐	☐
(b) a friend	☐	☐
(c) a religious group member	☐	☐
(d) a social agency representative	☐	☐

_____ (specify)

24. Do you have a telephone?

No ☐

Yes ☐ Have you used your telephone in the last week to call:

	No	Yes
(a) a friend	☐	☐
(b) a religious group member	☐	☐
(c) a social agency representative	☐	☐

_____ (specify)

25. Have you been called in the last week by a social agency representative?

☐ ☐ → _____ (specify)

26. How long has it been since you last had a holiday?

_____ months

27. During the last year, have any of the following things happened to you?

	No	Yes
(a) Separation from your spouse	☐	☐
(b) Divorce	☐	☐
(c) Gone on GAINS (Guaranteed Annual Income Supplements during the last year)	☐	☐

continued

27. *(continued)*

During the last year have any of the following things happened to you?

		No	Yes
(d)	Trouble getting along with friends/relatives during the last year	☐	☐
(e)	Retired from work during the last year	☐	☐
(f)	A death in the family in the last year	☐	☐
(g)	Changed your residence in the last year	☐	☐
(h)	Some other problem or change in your life	☐	☐

Now I will read some statements about life in general. Everyone is being asked the same questions and they are all matters of individual feeling, not of "right" or "wrong" answers. They are important to the study because we want to know how you are feeling. Everyone's opinion differs on these questions. The first statement is:

INTERVIEWER: Check ONE answer per question.

28.	Little things bother me more this year.	No ☐	Yes ☐
29.	I sometimes worry so much I can't sleep.	No ☐	Yes ☐
30.	I am afraid of a lot of things.	No ☐	Yes ☐
31.	I get mad more than I used to.	No ☐	Yes ☐
32.	I take things hard.	No ☐	Yes ☐
33.	I get upset easily.	No ☐	Yes ☐
34.	Things keep getting worse as I get older.	No ☐	Yes ☐
35.	I have as much pep as I had last year.	No ☐	Yes ☐
36.	As I get older, things are better than I thought they would be.	No ☐	Yes ☐
37.	I am as happy now as when I was younger.	No ☐	Yes ☐
38.	As you get older you are less useful.	No ☐	Yes ☐
39.	How much do you feel lonely?	Not Much ☐	A Lot ☐
40.	I see enough of my friends and relatives.	No ☐	Yes ☐
41.	I sometimes feel that life isn't worth living.	No ☐	Yes ☐
42.	Life is hard for me much of the time.	No ☐	Yes ☐
43.	Are you satisfied with your life today?	No ☐	Yes ☐
44.	I have a lot to be sad about.	No ☐	Yes ☐

END OF QUESTIONNAIRE

APPENDIX F

HEALTH SERVICE UTILIZATION DATA COLLECTION FORMS

This appendix contains various forms for the collection of health service utilization data from hospitals, physician's offices and agencies in the community. Included are (1) Hospital Record Abstraction Form (2) Physician's Office Daysheet (3) General Health Service Utilization Data Sheet and (4) Specific Community Agency Data Sheet.

As the study staff become aware of use of a particular agency or service by a patient, this will be noted on the general data sheet and a specific sheet will be filled out for that patient for that agency.

I. HOSPITAL RECORD ABSTRACTION FORM

FOR OFFICE USE

Patient I.D. # _____

Physician I.D.# _____

Name of Hospital: _____

Family Name: _____

Patient's Christian Name: _____

Date of Birth: [ ][ ][ ][ ][ ][ ]
Day Month Year

O.H.I.P. Number [ ][ ][ ][ ][ ][ ][ ][ ]

Date This Form Completed: [ ][ ][ ][ ][ ][ ]
Day Month Year

Family Physician: _____

Attending Physician(s): _____

_____

Admission Date: [ ][ ][ ][ ][ ][ ]
Day Month Year

Ward Name: _____ Ward Type: _____

Type: _____

Diagnosis(es): _____

_____

_____

Length of Stay: _____ days

Transfer to Ward: _____ Type: _____

Date: [ ][ ][ ][ ][ ][ ]
Day Month Year

Type: _____

Diagnosis Change? ☐ No ☐ Yes _____

_____

_____

Length of Stay: _____ days

Transfer to Ward: _____ Type: _____

Date: [ ][ ][ ][ ][ ][ ]
Day Month Year

Type: _____

Diagnosis Change? ☐ No ☐ Yes _____

_____

_____

Length of Stay: _____ days

Hospital Record Abstraction Form (continued)

FOR OFFICE USE

Discharge Date: [ ][ ][ ][ ][ ][ ]
Day Month Year

Death (if applicable): [ ][ ][ ][ ][ ][ ]
Day Month Year

Discharge Diagnosis(es): _____

_____

_____

Surgical/Diagnostic Procedures:

1. _____
2. _____
3. _____
4. _____
5. _____

Billing Code:

1. [ ][ ][ ][ ]
2. [ ][ ][ ][ ]
3. [ ][ ][ ][ ]
4. [ ][ ][ ][ ]
5. [ ][ ][ ][ ]

Discharged to:
1. Home ☐
2. Nursing Home ☐
3. Chronic Hosp. ☐
4. Home Care ☐
5. Other ☐
_____ (specify)
6. Not Listed ☐

Emergency Room Visits:

Date:	Admitted?	
[ ][ ][ ][ ][ ][ ] Day Month Year	☐ Yes	☐ No
[ ][ ][ ][ ][ ][ ]	☐ Yes	☐ No
[ ][ ][ ][ ][ ][ ]	☐ Yes	☐ No

Hospital Record Abstraction Form (continued)

FOR OFFICE USE

Day Care Services:

Admission Date:

Day Month Year

Days per Week: Changed to days per week

Date:

Day Month Year

Discharge Date:

Day Month Year

Re-admission Date:

Day Month Year

Days per Week Changed to days per week

Date:

Day Month Year

Discharge Date:

Day Month Year

Day Care Days:

2. PHYSICIAN'S OFFICE DAYSHEET

FOR OFFICE USE

Opted In ☐

Physician: _____ Opted Out ☐

Patient's Surname: _____

Given Names: _____

O.H.I.P. Number: ☐☐☐☐☐☐☐☐

Date of Birth: ☐☐☐☐☐☐
Day Month Year

Date this form completed: ☐☐☐☐☐☐
Day Month Year

If opted out of O.H.I.P., will this patient be charged the O.H.I.P. fee? ☐ a higher fee? ☐

Procedure	Billing Code	Date
	☐☐☐☐	☐☐☐☐☐☐ Day Month Year
	☐☐☐☐	☐☐☐☐☐☐
	☐☐☐☐	☐☐☐☐☐☐
	☐☐☐☐	☐☐☐☐☐☐
	☐☐☐☐	☐☐☐☐☐☐
	☐☐☐☐	☐☐☐☐☐☐
	☐☐☐☐	☐☐☐☐☐☐

Referrals: To:	Date
	☐☐☐☐☐☐ Day Month Year
	☐☐☐☐☐☐
	☐☐☐☐☐☐

Physician's Office Daysheet (continued)

Laboratory Tests Ordered

Please check one box for each time a particular test is ordered.

Biochemistry

- Bilirubin, total
- Chloride
- Cholesterol
- CO_2 content
- Phosphatase Alk.
- Potassium
- SGOT
- Sodium
- T_3 uptake
- T_4 total
- Triglycerides
- Urea Nitrogen (BUN)
- Uric Acid
- Urinalysis

Haematology

- Blood Film Exam
- Haematocrit
- Haemoglobin
- Prothrombin Time
- Sed. Rate
- W.B.C.

Immunology

- Heterophile antibodies
- Monoscreen Titre

Microbiology

- Cervical, vaginal
- Stool
- Sputum
- Urine

X-rays Ordered

Name of Procedure	Billing Code

Physician's Office Daysheet (continued)

Drugs Ordered

Name	Dose	Times per Day	How Long?	Date (Day Month Year)
			days	
			days	
			days	
			days	
			days	
			days	
			days	
			days	
			days	
			days	

Equipment

Please note below any medical equipment or sick-room supplies noted in the chart for use in the home.

Wheelchair ☐ Bed ☐
Cane ☐ Commode ☐
Walker ☐ Lifting Devices ☐
Crutches ☐
Other ☐ _____ (specify)

Institutional Admissions Noted

Institution	Admission Date (Day Month Year)

Physician's Office Daysheet (continued)

Surgical/Diagnostic Procedures

Please note any surgical or diagnostic procedures listed in the office chart which were performed during the institutionalizations noted above.

Name of Procedure

_____

_____

_____

_____

_____

_____

3. GENERAL HEALTH SERVICE UTILIZATION DATA SHEET

Patient I.D.#: _____

Family Name: _____

Given Names: _____

Date of Birth: [ ][ ][ ][ ][ ][ ]
Day Month Year

1. Services

	Total Visits	Average Hours/Visit
a) V.O.N.	[ ][ ]	[ ][ ]
b) St. Elizabeth Visiting Nurses	[ ][ ]	[ ][ ]
c) P.H.N.	[ ][ ]	[ ][ ]
d) Other Nursing	[ ][ ]	[ ][ ]
e) Physiotherapy	[ ][ ]	[ ][ ]
f) Occupational Therapy	[ ][ ]	[ ][ ]
g) Social Services	[ ][ ]	[ ][ ]
h) Speech Therapy	[ ][ ]	[ ][ ]
i) Homemaking	[ ][ ]	[ ][ ]
	Total Meals	
j) Meals on Wheels	[ ][ ]	

2. Agencies *Check appropriate agency and name where necessary*

Nursing: V.O.N. ☐ S.E.N. ☐ P.H.N. ☐ Other ☐ _____ *specify*

Physiotherapy: Home Care ☐ Other ☐ _____ *specify*

Occupational Therapy: Home Care ☐ Other ☐ _____ *specify*

Social Services: Home Care ☐ Other ☐

_____ *specify*

Speech Therapy: Home Care ☐ Other ☐

_____ *specify*

Meals on Wheels: V.O.N. ☐ Macassa ☐ Dundas ☐

Homemaking: V.H.A. ☐ Red Cross ☐ Private ☐

_____ *specify*

3. Distances

		Other Agencies *specify*	
Physician's Office	☐☐		
Chedoke	☐☐	_____	☐☐
McMaster	☐☐	_____	☐☐
Henderson	☐☐	_____	☐☐
Hamilton General	☐☐	_____	☐☐
St. Joseph's	☐☐	_____	☐☐
St. Peter's	☐☐	_____	☐☐
Home Care	☐☐	_____	☐☐

4. Institutions

Hospital Days: Active ☐☐ Chronic ☐☐ Rehab ☐☐

Day Care _____ ☐☐
specify

Nursing Home Days: ☐☐ Home for Aged Days: ☐☐

Lodging Home Days: ☐☐ Home for Special Care Days: ☐☐

Retirement Home Days: ☐☐

Emergency Room Visits: ☐☐

5. Equipment *Please note number of weeks used*

Wheelchair ☐☐ Cane ☐☐ Commode ☐☐ Walker ☐☐

Bed ☐☐ Other ☐☐ _____
specify

4. SPECIFIC COMMUNITY AGENCY DATA SHEET

Patient I.D. #: _____

Family Name: _____

Given Names: _____

Birth Date: [ ][ ][ ][ ][ ][ ]
Day Month Year

Name of Agency: _____

Admission Date: [ ][ ][ ][ ][ ][ ] Discharge Date: [ ][ ][ ][ ][ ][ ]
Day Month Year Day Month Year

Visits/week [ ][ ] Hours/visit [ ][ ]

Changed to: Visits/week [ ][ ] Hours/visit [ ][ ] Date: [ ][ ][ ][ ][ ][ ]
Day Month Year

Changed to: Visits/week [ ][ ] Hours/visit [ ][ ] Date: [ ][ ][ ][ ][ ][ ]

Distance (miles) [ ][ ]